

ΒΙΟΓΡΑΦΙΚΟ ΣΗΜΕΙΩΜΑ

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ΑΛΕΞΑΝΔΡΟΥ ΚΑΤΣΑΟΥΝΗ

**Αναπληρωτή Καθηγητή
Τμήματος Χημικών Μηχανικών
Πανεπιστημίου Πατρών**

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Ενημέρωση Ιούλιος 2018



Αλέξανδρος Κατσαούνης

Αναπληρωτής Καθηγητής

Τμήμα Χημικών Μηχανικών

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[Google Scholar Citations Profile](#)

ΑΤΟΜΙΚΑ ΣΤΟΙΧΕΙΑ

Ημερομηνία Γέννησης: 12 Φεβρουαρίου 1977

Οικογενειακή Κατάσταση: Έγγαμος με δυο παιδιά

Υπηκοότητα: Ελληνική

ΕΚΠΑΙΔΕΥΣΗ

1999 - 2004 Διδακτορικό Δίπλωμα
Πανεπιστήμιο Πατρών, Τμήμα Χημικών Μηχανικών

Τίτλος Διατριβής: *Μελέτη της Ηλεκτροχημικής Ενίσχυσης χρησιμοποιώντας θερμοπρογραμματιζόμενη εκρόφηση, οξείδωση και πειράματα δυναμικής απόκρισης σε συνθήκες υψηλού κενού*

1994 - 1999 **Δίπλωμα Χημικού Μηχανικού**
Πανεπιστήμιο Πατρών, Τμήμα Χημικών Μηχανικών

ΕΠΑΓΓΕΛΜΑΤΙΚΗ ΕΞΕΛΙΞΗ

2015 - Αναπληρωτής Καθηγητής
Πανεπιστήμιο Πατρών, Τμήμα Χημικών Μηχανικών (ΤΧΜ-ΠΠ)

2011 - 2015 Επίκουρος Καθηγητής
Πανεπιστήμιο Πατρών, Τμήμα Χημικών Μηχανικών (ΤΧΜ-ΠΠ)

2010 Επισκέπτης Ερευνητής στο Πολυτεχνείο της Λωζάνης (Ecole Polytechnique Fédérale de Lausanne (EPFL), Institute of Chemical Sciences and Engineering, Lausanne, Switzerland)

2006 - 2010 Λέκτορας
Πολυτεχνείο Κρήτης, Τμήμα Μηχανικών Περιβάλλοντος (ΤΜΠ-ΠΚ)

2004-2006 Ερευνητής
Πανεπιστήμιο Πατρών, Τμήμα Χημικών Μηχανικών
Εργ. Χημικών Διεργασιών & Ηλεκτροχημείας

ΔΙΟΙΚΗΤΙΚΗ ΕΜΠΕΙΡΙΑ

2018 -	Αναπληρωτής Πρόεδρος ΤΧΜ-ΠΠ
2018 -	Οικονομικός Υπεύθυνος ΤΧΜ-ΠΠ
2018 -	Επιστημονικός και Οικονομικός Υπεύθυνος των προγραμμάτων του Μηχανουργείου του ΠΠ
2016 -	Πρόεδρος της Εφορείας της Φοιτητικής Εστίας του ΠΠ
2015 - 2017	Πρόεδρος της Επιτροπής Καθαριότητας του ΠΠ
2013 -	Πρόεδρος της Επιτροπής Κτηρίου και Υποδομών ΤΧΜ-ΠΠ
2013-	Σύμβουλος Καθηγητής για προπτυχιακούς φοιτητές του ΤΧΜ-ΠΠ
2012-2014	Υπεύθυνος οργάνωσης των σεμιναρίων (από Καθηγητές και Ερευνητές του εσωτερικού και εξωτερικού) του ΤΧΜ-ΠΠ
2008-2010	Υπεύθυνος Γραμματείας (Τμήμα Σπουδών) ΤΜΠ-ΠΚ για θέματα φοιτητολογίου (ειδικό λογισμικό ελέγχου των μαθημάτων, δηλώσεων μαθημάτων, εγγραφής και έκδοσης πιστοποιητικών για τους φοιτητές)
2007-2008	Εκπρόσωπος του ΤΜΠ στη Σύγκλητο του Πολυτεχνείου Κρήτης
2007-2008	Ακαδημαϊκός Υπεύθυνος στην Πρακτική Άσκηση Φοιτητών ΤΜΠ-ΠΚ, Φάση Γ – ΕΠΕΑΕΚ II

ΜΕΛΟΣ ΕΠΙΣΤΗΜΟΝΙΚΩΝ ΟΡΓΑΝΙΣΜΩΝ

- International Society of Electrochemistry (ISE)
- The Electrochemical Society (ECS)
- Working Party on Electrochemical Engineering (European Federation of Chemical Engineering)
- Hellenic Federation of Chemical Engineering

ΕΠΙΣΤΗΜΟΝΙΑ ΕΝΔΙΑΦΕΡΟΝΤΑ

1. Μελέτη του μηχανισμού του φαινομένου της Ηλεκτροχημικής Ενίσχυσης της Κατάλυσης (EPOC or NEMCA effect) και των αλληλεπιδράσεων φορέα-μετάλλου
2. Ηλεκτροχημική Ενίσχυση υποστηριγμένων καταλυτών κατά την υδρογόνωση του CO₂ προς παραγωγή καυσίμων και χρήσιμων χημικών προϊόντων
3. Παρασκευή, φυσικοχημικός-ηλεκτροχημικός χαρακτηρισμός και εφαρμογές καινοτόμων ανοδικών ηλεκτροδίων τύπου DSA (Dimensionally Stable Anodes) σε εφαρμογές ηλεκτροχημικής και φωτοηλεκτροχημικής επεξεργασίας υγρών αποβλήτων
4. Συμβατική και τριοδική λειτουργία κυψελίδων καυσίμου χαμηλών θερμοκρασιών με τροφοδοσία υδρογόνου και αλκοολών.
5. Παρασκευή, φυσικοχημικός-ηλεκτροχημικός χαρακτηρισμός και εφαρμογές καινοτόμων ηλεκτροδίων σε εφαρμογές κυψελίδων καυσίμου υδρογόνου και αλκόλης
6. Ηλεκτροχημικοί αισθητήρες για φαινολικές ενώσεις σε υδατικά διαλύματα

ΔΙΔΑΚΤΙΚΟ ΕΡΓΟ

Αυτοδύναμο διδακτικό έργο σε προπτυχιακό επίπεδο

2011 -	“Εισαγωγή στη Χημική Μηχανική”, 1 ^ο εξάμηνο ΤΧΜ-ΠΠ
2011 - 2012	“Χημικές Διεργασίες Ι”, 6 ^ο εξάμηνο ΤΧΜ-ΠΠ
2011 - 2012	“Φυσικές Διεργασίες ΙΙ”, 6 ^ο εξάμηνο ΤΧΜ-ΠΠ
2011 -	“Ενόργανη Χημική Ανάλυση”, 6 ^ο εξάμηνο ΤΧΜ-ΠΠ
2013 - 2017	“Φυσικοχημεία ΙΙ”, 6 ^ο εξάμηνο ΤΧΜ-ΠΠ
2006 - 2011	“Τεχνολογίες Επεξεργασίας Αερίων Εκπομπών”, 8 ^ο εξάμηνο ΤΜΠ-ΠΚ
2006 - 2011	“Διαχείριση Αερίων Εκπομπών”, 9 ^ο εξάμηνο ΤΜΠ-ΠΚ
2007 - 2009	“Τεχνική Χημικών Διεργασιών”, 5 ^ο εξάμηνο ΤΜΠ-ΠΚ
2009 - 2011	“Ρύπανση και Έλεγχος ρύπανσης Αέρα”, 5 ^ο εξάμηνο ΤΜΠ-ΠΚ

Αυτοδύναμο διδακτικό έργο σε μεταπτυχιακό επίπεδο

2013 -	“Διαχείριση Αερίων Εκπομπών”, Ελληνικό Ανοιχτό Πανεπιστήμιο (ΕΑΠ)
2006 - 2011	“Περιβαλλοντική Κατάλυση”, ΤΜΠ-ΠΚ
2008 - 2011	“Εφαρμοσμένη Ηλεκτροχημεία”, ΤΜΠ-ΠΚ

ΕΠΙΒΛΕΨΗ ΦΟΙΤΗΤΩΝ

Επιβλέπων Καθηγητής στις διδακτορικές διατριβές των:

Μαριαλένα Μακρή (ΠΠ)	Μελέτη του φαινομένου ΝΕΜCΑ κατά την υδρογόνωση του CO ₂ με χρήση στερεών ηλεκτρολυτών αγωγών ιόντων αλκαλίων (Na ⁺ και K ⁺)
Bjorn Hasa (ΠΠ)	Μελέτη του μηχανισμού οξειδωσης αλκοολών με χρήση διαφορικής ηλεκτροχημικής φασματοσκοπίας μάζας (DEMS) και άλλων ηλεκτροχημικών τεχνικών (υπό ολοκλήρωση)

Επιβλέπων Καθηγητής στις μεταπτυχιακές διατριβές των:

Bjorn Hasa (ΠΠ)	Ανοδικά ηλεκτρόδια Pt-TiO ₂ για την ηλεκτροχημική οξειδωση αλκοολών σε κυψελίδες καυσίμου χαμηλών θερμοκρασιών
Ευτυχίας Μαρτίνο (ΠΠ)	Μελέτη της απόδοσης κυψελίδων καυσίμου πρωτονιακής μεμβράνης (PEMFCs) υπό συνθήκες τριοδικής λειτουργίας
Ευάγγελου Καλαμαρά (ΠΠ)	Ανοδικά ηλεκτρόδια Pt-Ru-TiO ₂ για την ηλεκτροχημική οξειδωση αλκοολών σε κυψελίδες καυσίμου χαμηλών θερμοκρασιών
Μαριαλένας Μακρή (ΠΠ)	Μελέτη της ηλεκτροχημικής ενίσχυσης της αναγωγής του διοξειδίου του άνθρακα σε καταλύτη ρουθηνίου (Ru) υποστηριζόμενου σε αγωγό ιόντων νατρίου, β ^γ -Al ₂ O ₃ .

Veronique Amstutz (EPFL)	Influence of carbonate on electrochemical oxidation of chloride, ammonia and urea. Application to synthetic urine treatment
Αθανασίας Καταμήτσου (ΕΑΠ)	Παραγωγή καυσίμων και χρήσιμων χημικών προϊόντων μέσω καταλυτικών και ηλεκτροχημικών διεργασιών αναγωγής του CO ₂
Μαλάμωσ Βακαλοπούλου (ΕΑΠ)	Κυψελίδες καυσίμου τροφοδοτούμενες με βιοκαύσιμα
Ιωάννη Μόσχου (ΕΑΠ)	Κατανομή ρύπων από ελαφρά οχήματα στον πολεοδομικό ιστό της Πάτρας
Θεοδωρας Μπάρκα (ΕΑΠ)	Συμβατικές και εναλλακτικές μέθοδοι παρακαλούθησης και ελέγχου της αέριας ρύπανσης – Εφαρμογή στην περίπτωση της Κοζάνης
Αλέξανδρας Λυκουρέζου (ΕΑΠ)	Ανθρακικό Αποτύπωμα Προϊόντος: η περίπτωση των παραγόμενων αζωτούχων λιπασμάτων
Νικολέττας Στεριώτη (ΕΑΠ)	Διεργασίες απομάκρυνσης οξειδίων του αζώτου από απαέρια καύσης
Ειρήνης Τρυφινούπουλου (ΕΑΠ)	Η συμβολή της χρήσης των φυτοφαρμάκων στην ατμοσφαιρική ρύπανση και στη δημόσια υγεία
Σταματίνας Τσούκα (ΕΑΠ)	Διαχείριση φωτοβολταϊκών αποβλήτων κρυσταλλικού πυριτίου
Κωνστανίνου Κουτσούλη (ΕΑΠ)	Σύγχρονες τάσεις στην Ηλεκτροκατάλυση
Ιωάννη Χαχλαδάκη (ΠΚ)	Ανάπτυξη ηλεκτροχημικής μεθόδου υπολογισμού του συντελεστή αποτελεσματικότητας ανοδικών ηλεκτροδίων Ti/IrO ₂ κατά την οξειδωση αλκοολών
Αλέξανδρου Νάκου (ΠΚ)	Μελέτη του φαινομένου της Ηλεκτροχημικής Ενίσχυσης κατά την οξειδωση μεθανίου πάνω σε Rh/YSZ
Μανώλη Κοτρωνάκη (ΠΚ)	Μελέτη κυψελίδας καυσίμου πρωτονιακής μεμβράνης (PEMFC) με χρήση συμβατικών (υδρογόνο) και εναλλακτικών (αλκοόλες) καυσίμων
Νίκου Παπαστεφανάκη (ΠΚ)	Παρασκευή, χαρακτηρισμός και μελέτη ανοδικών ηλεκτροδίων RuO ₂ υποστηριγμένων σε Ti κατά την οξειδωση πρότυπων οργανικών ενώσεων και αποβλήτων ελαιουργείου

Επιβλέπων Καθηγητής στις προπτυχιακές εργασίες των:

Δήμητρας Ίλτσιου (ΠΠ), Μαρίας Μπάρδη (ΠΠ), Παναγιώτας Δόικα (ΠΠ), Κατερίνας Τζαμαλή (ΠΠ), Κυριακής Δερματά (ΠΠ), Αλίκης Σαμαρά (ΠΠ), Χάρη Ιωακειμίδη (ΠΠ), Κατερίνας Παπαμάρκου

(ΠΠ), Χριστίνας Γκίκα (ΠΠ), Παναγιώτη Λάππα (ΠΠ), Elizabetta Turro (ΠΚ – Erasmus), Στέλλας Μιχαήλ (ΠΚ), Χάρη Πανακούλια (ΠΚ), Παναγιώτη Καλατζή (ΠΚ), Μελέτη Φουσκαρή (ΠΚ), Ανδρέα Δήμου (ΠΚ)

ΕΞΕΤΑΣΤΗΣ ΔΙΔΑΚΤΟΡΙΚΩΝ ΔΙΑΤΡΙΒΩΝ

Μέλος της 7/μελούς εξεταστικής επιτροπής των διδακτορικών διατριβών των:

Ιωάννας Καλαϊτζίδου (ΠΠ), Καλλιόπης Κούση (ΠΠ), Σταυρούλας Σφαέλου (ΠΠ), Στέλιου Βογιατζή (ΠΠ), Ασημίνας Τρεμούλη (ΠΠ), Δημήτρη Θελερίτη (ΠΠ), Hripsime Gasparyan (ΠΠ), Αλίν Ορφανίδη (ΠΠ), Μιχαήλ Αθανασίου (ΠΠ), Πέτρου Καραγεώργου (ΠΚ), Θεοδώρας Βελεγράκη (ΠΚ), Καλλιόπης Αναστασιάδου (ΠΚ), Ζαχαρία Φροντιστή (ΠΚ), Μαρίας Αϊβαλιώτη (ΠΚ), Ευθαλίας Χατζησυμεών (ΠΚ), Απόστολου Γιαννή (ΠΚ), Εμμανουήλ Διαλυνά (ΠΚ), Ευθυμίας Τσολάκη (ΠΚ), Ιωάννη Χαχλαδάκη (ΠΚ).

ΕΡΕΥΝΗΤΙΚΑ ΠΡΟΓΡΑΜΜΑΤΑ

ΕΠΙΣΤΗΜΟΝΙΚΟΣ ΥΠΕΥΘΥΝΟΣ

1. Τίτλος: "Καταλυτική επεξεργασία σωματιδίων άνθρακα (soot) προερχόμενα από μηχανές εσωτερικής καύσης Diesel"
Φορέας Χρηματοδότησης: ΕΛΚΕ Πολυτεχνείου Κρήτης
Προϋπολογισμός: € 5.000
Διάρκεια: 2007-2008
2. Τίτλος: "Κατασκευή και Μελέτη κυψελίδας καυσίμου αλκοόλης χαμηλών θερμοκρασιών"
Φορέας Χρηματοδότησης: ΕΛΚΕ Πολυτεχνείου Κρήτης
Προϋπολογισμός: € 12.000
Διάρκεια: 2008-2010
3. Τίτλος: "Μετρήσεις και κατανομή στο χώρο αερίων εκπομπών από μονάδα παραγωγής ασφαλομίγματος"
Φορέας Χρηματοδότησης: Ιδιωτική εταιρεία ΦΙΝΟΜΠΕΤΟΝ – Χορδάκη Χανίων
Προϋπολογισμός: € 10.000
Διάρκεια: 2009-2010
4. Τίτλος: "Electrochemical Promotion of aerobic-catalytic treatment of toxic pollutants in aqueous phase"
Φορέας Χρηματοδότησης: Γενική Γραμματεία Έρευνας και Τεχνολογίας – Ευρωπαϊκή Ένωση (Πρόγραμμα ΑΡΙΣΤΕΙΑ)
Προϋπολογισμός: € 300.000
Διάρκεια: 2014-2016
5. Τίτλος: "Παρασκευή και μελέτη ανοδικών ηλεκτροδίων για χαμηλής θερμοκρασίας κυψελίδες καυσίμου αλκοολών" (Πρόγραμμα Καραθεοδωρή)
Φορέας Χρηματοδότησης: ΕΛΚΕ Πανεπιστημίου Πατρών
Προϋπολογισμός: € 33.000

Διάρκεια: 2014-2017

6. Τίτλος: "Μελέτη νανοδισπαρμένων καταλυτών και κλιμάκωση μεγέθους ηλεκτροενισχυμένων αντιδραστήρων για αντιδράσεις υδρογόνωσης" (Πρόγραμμα ΑΡΙΣΤΕΙΑ ΙΚΥ/SIEMENS)
Φορέας Χρηματοδότησης: Ίδρυμα Κρατικών Υποτροφιών (ΙΚΥ)
Προϋπολογισμός: € 36.900
Διάρκεια: 2016-2018

ΜΕΛΟΣ ΕΡΕΥΝΗΤΙΚΗΣ ΟΜΑΔΑΣ

- 2018-2021 ΕΥΔΕ-ΕΤΑΚ – Ερευνώ – Δημιουργώ – Καινοτομώ Τ1ΕΔΚ-01631: Κλιμάκωση μεγέθους της Ηλεκτροχημικά ενισχυόμενης καταλυτικής υδρογόνωσης του CO₂ προς παραγωγή καυσίμων
- 2014-2018 ESA RPEMFC: 4000109578/13/NL/SC Development of a Closed Loop Regenerative HT PEM Fuel Cell System
- 2012-2015 ΕΥΔΕ-ΕΤΑΚ – ΣΥΝΕΡΓΑΣΙΑ 09ΣΥΝ-42-729: Ανάπτυξη νανοδομημένων ηλεκτροδίων για την ηλεκτρόλυση του νερού σε διατάξεις πολυμερικής μεμβράνης υψηλής θερμοκρασίας (HT-PEM-ELE)
- 2012-2015 ΕΥΔΕ-ΕΤΑΚ – ΣΥΝΕΡΓΑΣΙΑ 09ΣΥΝ-32-615: Ηλεκτροχημική ενίσχυση της καταλυτικής υδρογόνωσης του CO₂ προς παραγωγή καυσίμων (ECHO₂)
- 2011-2013 ΓΓΕΤ – ΑΡΙΣΤΕΙΑ: Ηλεκτροχημική ενίσχυση της κατάλυσης για την υδρογόνωση του CO₂ σε χρήσιμα καύσιμα και χημικά προϊόντα (Electrofuels)
- 2004-2006 FP6-2003-NEST-A: Electrocatalytic Gas-Phase Conversion of CO₂ in Confined Catalysts
- 2004-2006 Greek Programme 04 AKMON 61 supported from the Greek General Secretary of Research and Technology
- 2000-2003 Growth Project GRD1-1999-10239 Oxidation catalyst deactivation
- 1999-2002 European Project GRD1-1999-10239 – Study of the mechanism of Catalyst Deactivation for ethylene oxide and vinyl acetate reactions
- 1997-1999 Electric Power Research Institute (EPRI) contact WO8065-25 – Electrochemical Promotion of Ammonia Synthesis from N₂ and H₂

ΔΙΑΚΡΙΣΕΙΣ - ΒΡΑΒΕΙΑ

Carl Wagner Medal Award in Electrochemical Engineering, European Federation of Chemical Engineering, Working Party on Electrochemical Engineering, 2008

ΠΡΟΣΚΕΚΛΗΜΕΝΕΣ ΟΜΙΛΙΕΣ

"Recent advances in Electrochemical Promotion of Catalysis", 4th Training course: Trends in Electrochemical Promotion of Catalysis (TEPOC), Almagro, Ciudad Real, Spain, November 24-26, 2009

"Effectiveness factor of isopropanol oxidation and various redox couples on IrO₂ based electrodes of different loading", 60th International Society of Electrochemistry Annual Meeting, August 16-21, 2009, China

"Temperature Programmed Desorption Techniques for the origin of Electrochemical Promotion of Catalysis (EPOC)", University of Belgrade, Faculty of Technology and Metallurgy, December 8, 2008, Republic of Serbia

"Electrochemical Promotion of Catalysis (EPOC)... on the way to explore the mechanism of promotion and develop the next generation of electropromoted reactors", 8th European Symposium on Electrochemical Engineering, Prague August 24-28, 2008

"Characterization techniques for electrode applications in PEM fuel cells and electropromoted reactors", 1st training course: Basics and Applications of Solid state Electrochemistry (BASE), Patras, Greece, 2007

ΔΙΠΛΩΜΑ ΕΥΡΕΣΙΤΕΧΝΕΙΑΣ

"Method and apparatus for carrying out electrochemically promoted reactions" , C.G. Vayenas, S. Balomenou, D. Tsiplakides, **A. Katsaounis**, S. Brosda, G. Foti, C. Comninellis, S. Thieman-Handler, B. Cramer, World Intellectual Property Organization (WO/2005/072860).

ΜΕΛΟΣ ΣΥΝΤΑΚΤΙΚΗΣ ΕΠΙΤΡΟΠΗΣ ΕΠΙΣΤΗΜΟΝΙΚΟΥ ΠΕΡΙΟΔΙΚΟΥ

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ΔΗΜΟΣΙΕΥΣΕΙΣ

ΚΕΦΑΛΑΙΑ ΣΕ ΒΙΒΛΙΑ

- C5. C.G. Vayenas, A. Katsaounis, S. Brosda and F. Sapountzi, "Electrochemical Promotion of Catalytic Reactions" in "Encyclopedia of Applied Electrochemistry", editors R.F. Savinell, Ken-ichiro Ota, G. Kreysa, Springer 2014
- C4. A. Katsaounis and S. Souentie " In-Cell Mediated (via Active Chlorine) Electrochemical Oxidation of Organic Pollutants in Water Using DSA Electrodes" in "Encyclopedia of Applied Electrochemistry", editors R.F. Savinell, Ken-ichiro Ota, G. Kreysa, Springer 2014
- C3. C.G. Vayenas, A. Katsaounis, S. Brosda and A. Hammad "Electrochemical Modification of Catalytic Activity" in "Handbook of Heterogeneous Catalysis", 2nd edition, editors G. Ertl, H. Knötzinger, F. Schüth and J. Weitcamp, Weinheim, 2008
- C2. A. Katsaounis, "Air Treatment Technologies" in Introduction to Environmental Engineering Science (in greek), Technical University of Crete, 2008
- C1. A. Katsaounis, S. Brosda and C.G. Vayenas, "Electrocatalysis" in Encyclopedia of Electrochemistry, Vol. 5, Wiley-VCH GmbH & Co KGaA, editors A.J. Bard, M. Stratmann etc, 2008

ΕΡΓΑΣΙΕΣ ΣΕ ΕΠΙΣΤΗΜΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ ΜΕ ΚΡΙΤΕΣ ΚΑΙ ΔΕΙΚΤΗ ΑΠΗΧΗΣΗΣ

- P62. D. Zagoraios, I. Kalaitzidou, S. Ntais, S. Brosda, A. Katsaounis and C.G. Vayenas "Study of the electrochemical promotion of methane oxidation in Pd catalysts supported on YSZ ", Materials Today: Proceedings (2018), in press.
- P61. B. Hasa, J. Vakros, A. Katsaounis "Study of low temperature alcohol electro-reforming", Materials Today: Proceedings (2018), in press.
- P60. M. Makri, A. Symillidis, D. Grigoriou, A. Katsaounis and C. G. Vayenas "Electrochemical Promotion of CO₂ reduction on a dispersed Ru/YSZ catalyst supported on YSZ solid electrolyte", Materials Today: Proceedings (2018), in press.
- P59. A. Katsaounis, D. Teschner, S. Zafeiratos "The effect of polarization and reaction mixture on the Rh/YSZ oxidation state during ethylene oxidation studied by Near Ambient Pressure XPS", Topics in Catalysis (2018) in press
- P58. B. Hasa, J. Vakros, A. Katsaounis, "Effect of TiO₂ on Pt-Ru-based anodes for methanol electroreforming", Applied Catalysis B: Environmental, 237 (2018) 811-816
- P57. A. Kotsiras, I. Kalaitzidou, D. Grigoriou, A. Symillidis, M. Makri, A. Katsaounis, C.G. Vayenas "Electrochemical promotion of nanodispersed Ru-Co catalysts for the hydrogenation of CO₂", Applied Catalysis B: Environmental, 232 (2018) 60-68
- P56. M. Athanasiou, B. Hasa, J. Vakros, L. Sygellou, A. Katsaounis "Electrochemical promotion of carbon supported Pt, Rh and Pd catalysts for H₂ oxidation in aqueous alkaline media", J. Chem. Technol. Biotechnol. 93(6) (2018) 1542-1548

- P55. I. Drakakaki, B. Hasa, A. Katsaounis and Ch. Apostolopoulos
"Resistance and Mechanical Characteristics of dual-phase steel B500c, after shot blasting processes", *International Journal of Structural Integrity* 8(5) (2017) 544-564
- P54. E. Martino, G. Koiliias, M. Athanasiou, A. Katsaounis, Y. Dimakopoulos, J. Tsamopoulos and C.G.Vayenas
"Experimental investigation and mathematical modeling of triode PEM fuel cells", *Electrochimica Acta* 248 (2017) 518-533.
- P53. V. Markou, M.-C. Kontogianni, Z. Frontistis, A.G. Tekerlekopoulou, A. Katsaounis, D. Vayenas
"Electrochemical treatment of biologically pre-treated dairy wastewater using dimensionally stable anodes", *Journal of Environmental Management* 202 (2017) 217-224
- P52. D. Niakolas, S. Neophytides, C.G. Vayenas, A. Katsaounis, N. Athanasopoulos, S. Balomenou, K-M Papazisi, D. Tsiplakides, M. Schautz
"Investigation of advanced components in a high pressure single cell electrolyser for the development of a HP-ELY stack as part of a regenerative fuel cell system", *E3S Web of Conferences* 16 (2017) 09004.
- P51. Z. Frontistis, M. Antonopoulou, M. Yazirdagi, Z. Kilin, I. Konstantinou, A. Katsaounis and D. Mantzavinos
"Boron-doped diamond electrooxidation of ethyl paraben: The effect of electrolyte on by-products distribution and mechanisms", *Journal of Environmental Management*, 195 (2017) 148-156
- P50. I. Kalaitzidou, M. Makri, D. Theleritis, A. Katsaounis and C.G. Vayenas
"Comparative study of the electrochemical promotion of CO₂ hydrogenation on Ru using Na⁺, K⁺, H⁺ and O²⁻ conducting solid electrolytes", *Surface Science*, 646 (2016) 194-203
- P49. M. Makri, A. Katsaounis and C.G. Vayenas
"Electrochemical Promotion of CO₂ hydrogenation on Ru catalyst-electrodes supported on β"-Al₂O₃(K⁺) solid electrolyte", *Electrochimica Acta*, 179 (2015) 556-564
- P48. B. Hasa, E. Kalamaras, E. Papaioannou, I. Vakros and A. Katsaounis
"Effect of TiO₂ Loading on Pt-Ru catalysts during methanol electrooxidation", *Electrochimica Acta*, 179 (2015) 578-587
- P47. I. Kalaitzidou, A. Katsaounis, T. Norby and C.G. Vayenas
"Electrochemical Promotion of the hydrogenation of CO₂ on Ru deposited on a BZY proton conductor", *Journal of Catalysis*, 331 (2015) 98-109
- P46. D. Theletiris, M. Makri, A. Caravaka, S. Souentie, A. Katsaounis and C.G. Vayenas
"Comparative study of the electrochemical promotion of CO₂ hydrogenation over Ru supported catalysts using electronegative and electropositive promoters"
ChemElectroChem, 1 (2014) 254–262
- P45. E.I. Papaioannou, E. Siokou, Ch. Comninellis and A. Katsaounis
"Pt-Ir binary electrodes for direct oxidation of methanol in low temperature fuel cells (DMFCs)"
Electrocatalysis 4 (2013) 375-381
- P44. B. Hasa, E. Kalamaras, E.I. Papaioannou, L. Sygellou and A. Katsaounis
"Electrochemical oxidation of alcohols on Pt-TiO₂ binary electrodes"
International Journal of Hydrogen Energy, 38 (2013) 15395-15404
- P43. S. Souentie, M. Athanasiou, D.K. Niakolas, A. Katsaounis, S.G. Neophytides, C.G. Vayenas
"Mathematical modeling of Ni/GDC and Au–Ni/GDC SOFC anodes performance under

internal methane steam reforming conditions”
Journal of Catalysis, 306 (2013) 116-128

- P42. V.M. Daskalaki, H. Marakas, D. Mantzavinos, A. Katsaounis, P. Gikas
“Use of seawater for the Boron-doped diamond electrochemical treatment of diluted vinasse wastewater”
Water Science and Technology 68 (2013) 2344–2350
- P41. D. Venieri, E. Chatzisyneon, E. Politi, S. Sofianos, A. Katsaounis, D.Mantzavinos
“Photoelectrocatalytic disinfection of water and wastewater: performance evaluation by qPCR and culture techniques”
Journal of Water and Health, 11 (2013) 21-29
- P40. D. Venieri, E. Chatzisyneon, S. Sofianos, E. Politi, N. Xekoukoulotakis, A. Katsaounis, D. Mantzavinos
“Removal of faecal indicator pathogens from waters and wastewaters by photoelectrocatalytic oxidation on TiO₂/Ti-films under simulated solar radiation”
Environmental Science & Pollution Research 19 (2012) 3782–3790
- P39. V. Amstutz, A. Katsaounis, A. Kapalka, Ch. Comninellis and K.-M. Udert
“Effects of carbonate on the electrolytic removal of ammonia and urea from urine with thermally prepared IrO₂ electrodes”
Journal of Applied Electrochemistry, 42 (2012) 787-795
- P38. D. Theleritis, S. Souentie, A. Katsaounis and C.G. Vayenas
“Hydrogenation of CO₂ over Ru/YSZ electropromoted catalysts”
ACS Catalysis, 2 (2012) 770
- P37. C. Jiménez-Borja, A. Consuegra, F. Sapountzi, F. Dorado, A. Katsaounis, J.L. Valverde
“Oscillatory behaviour of Rh/YSZ under electropromoted conditions”
Chemical Physics Letters, 519-520 (2012) 89-92
- P36. E. Tsantaki, T. Velegraki, A. Katsaounis, D. Mantzavinos
“Anodic oxidation of textile dyehouse effluents on boron-doped diamond electrode”
Journal of Hazardous Materials, 207-208 (2012) 91-96
- P35. Z. Frontistis, C. Brebou, D. Venieri, D. Mantzavinos, A. Katsaounis
“BDD anodic oxidation as tertiary wastewater treatment for the removal of emerging micro-pollutants, pathogens and organic matter”
Journal of Chemical Technology and Biotechnology 86 (2011) 1233-1236
- P34. E. Turro, A. Giannis, R. Cossu, E. Gidarakos, A. Katsaounis
“Electrochemical oxidation of stabilised landfill leachate on DSA electrodes”
Journal of Hazardous Materials, 190 (2011) 460
- P33. V. Daskalaki, E. Timotheatou, A. Katsaounis, D. Kalderis
“Degradation of Reactive Red 120 using hydrogen peroxide in subcritical water”
Desalination, 274 (2011) 200
- P32. Z. Frontistis, V.M. Daskalaki, A. Katsaounis, I. Poulios and D. Mantzavinos
“Electrochemical enhancement of solar photocatalysis: Degradation of endocrine disruptor bisphenol-A on Ti/TiO₂ films”, Water Research 45 (2011) 2996
- P31. V. Daskalaki, Z. Frontistis, D. Mantzavinos and A. Katsaounis
“Solar light-induced degradation of bisphenol-A with TiO₂ immobilized on Ti”
Catalysis Today, 161 (2011) 110

- P30. A. Kapałka, S. Fiero, Z. Frontistis, A. Katsaounis, S. Neodo, K.M. Udert and Ch. Comninellis
"Electrochemical oxidation of ammonia ($\text{NH}_4^+/\text{NH}_3$) on thermally and electrochemically prepared IrO_2 electrodes"
Electrochimica Acta, 56 (2011) 1361
- P29. A. Kapałka, A. Katsaounis, N.L. Michels, A. Leonidova, S. Souentie, Ch. Comninellis, Kai M. Udert
"Ammonia oxidation to nitrogen mediated by electrogenerated active chlorine on $\text{Ti}/\text{PtO}_x\text{-IrO}_2$ "
Electrochemistry Communications 12 (2010) 1203
- P28. A. Nakos, S. Souentie and A. Katsaounis
"Electrochemical promotion of methane oxidation on Rh/YSZ"
Applied Catalysis B: Environmental, 101 (2010) 31
- P27. E. Chatzisyneon, S. Fierro, I. Karafyllis, D. Mantzavinos, N. Kalogerakis, A. Katsaounis
"Anodic oxidation of phenol on Ti/IrO_2 electrode: Experimental studies"
Catalysis Today 151 (2010) 185
- P26. T. Panakoulias, P. Kalatzis, D. Kalderis and A. Katsaounis
"Electrochemical degradation of Reactive Red 120 using DSA and BDD anodes"
Journal of Applied Electrochemistry 40 (2010) 1759
- P25. T. Velegraki, N. Xekoukoulotakis, A. Katsaounis, E. Diamantopoulos and D. Mantzavinos
"Electrochemical oxidation of benzoic acid in water over BDD electrodes: Statistical analysis of key operating parameters, kinetic modelling, reaction by-products and ecotoxicity"
Chemical Engineering Journal 160 (2010) 538
- P24. Alexandros Katsaounis
"Recent developments and trends in Electrochemical Promotion of Catalysis"
Journal of Applied Electrochemistry, 40 (2010) 885
- P23. E.H. Calderon, J. Hahladakis, G. Foti and A. Katsaounis
"Effectiveness factor of isopropanol oxidation on IrO_2 based electrodes of different loading"
Electrochimica Acta, 55 (2010) 8215
- P22. N. Papastefanakis, D. Mantzavinos and A. Katsaounis
"DSA electrochemical treatment of olive mill wastewater on Ti/RuO_2 anode"
Journal of Applied Electrochemistry 40 (2010) 729
- P21. E.H. Calderon, A. Katsaounis, R. Wüthrich, P. Mandin, G. Foti, Ch. Comninellis
"Effectiveness factor of fast ($\text{Fe}^{3+}/\text{Fe}^{2+}$), moderate (Cl_2/Cl^-) and slow ($\text{O}_2/\text{H}_2\text{O}$) redox couples using IrO_2 based electrodes of different loading"
Journal of Applied Electrochemistry, 39 (2009) 1827
- P20. Chatzisyneon, E., Xekoukoulotakis, N.P., Diamadopoulos, E., Katsaounis, A. and Mantzavinos, D.
"Boron-doped diamond anodic treatment of olive mill wastewaters: Statistical analysis, kinetic modeling and biodegradability"
Water Research, 43 (2009) 3999
- P19. A. Kapałka, S. Fierro, Z. Frontistis, A. Katsaounis, O. Frey, M. Koudelka, Ch. Comninellis and K.M. Udert

"Electrochemical behaviour of ammonia ($\text{NH}_4^+/\text{NH}_3$) on electrochemically grown anodic iridium oxide film (AIROF) electrode"
Electrochemistry Communications 11 (2009) 1590

P18. E. Chatzisyneon, A. Dimou, D. Mantzavinos and A. Katsaounis
"Electrochemical Oxidation of model compounds and Olive Mill Wastewater over DSA electrodes: 1. The case of Ti/IrO_2 "
Journal of Hazardous Materials, 167 (2009) 268

P17. A. Katsaounis
"Temperature programmed desorption of oxygen from Pd films interfaced with Y_2O_3 -doped ZrO_2 "
Journal of Applied Electrochemistry, 38 (2008) 1097

P16. A. Katsaounis
"Electrochemical promotion of catalysis (EPOC): Perspectives for application to gas emissions treatment"
Global Nest Journal, 10 (2008) 225

P15. C.G. Vayenas, M. Tsampas and A. Katsaounis
"First principles analytical prediction of the conductivity of Nafion membranes"
Electrochimica Acta, 52 (2007) 2244-2256

P14. S. Balomenou, D. Tsiplakides, A. Katsaounis, S. Brosda, G. Foti, Ch. Comninellis, S. Thiemann-Handler, B. Cramer, and C.G. Vayenas
"Monolithic Electrochemically Promoted Reactors: A step for the practical utilization of Electrochemical Promotion"
Solid State Ionics, 177 (2006) 2201

P13. A. Katsaounis, M. Tsampas, S.P. Balomenou, D. Tsiplakides and C.G. Vayenas
"Potential-dependent electrolyte resistance and steady-state multiplicities of PEM fuel cells"
Solid State Ionics, 177 (2006) 2397

P12. C.G. Vayenas and A. Katsaounis
"Proton and electron wave-particles in chemical and physical environments"
Applied Catalysis B: Environmental, 64 (2006) 111

P11. C. Koutsodontis, A. Katsaounis, J.C. Figueroa, C. Cavalca and C.G. Vayenas
"The effect of catalyst film thickness on the magnitude of the Electrochemical Promotion for the case of ethylene oxidation on Pt/YSZ "
Topics in Catalysis, 39 (2006) 97-100

P10. C. Koutsodontis, A. Katsaounis, J.C. Figueroa, C. Cavalca and C.G. Vayenas
"The effect of catalyst film thickness on the magnitude of the Electrochemical Promotion of catalytic reactions"
Topics in Catalysis, 38 (2006) 157

P9. M. Tsampas, A. Picos, S. Brosda, A. Katsaounis and C.G. Vayenas
"The effect of membrane thickness on the conductivity of Nafion"
Electrochimica Acta, 51 (2006) 2743-2755

P8. A. Katsaounis, S.P. Balomenou, D. Tsiplakides and C.G. Vayenas
"The role of potential-dependent electrolyte resistance in the performance and steady-state multiplicities of PEM fuel cells: Experimental investigation and macroscopic modeling"
Electrochimica Acta, 50 (2005) 5132

P7. D. Tsiplakides, S. Balomenou, A. Katsaounis, C. Koutsodontis and C.G. Vayenas

"Electrochemical promotion of Catalysis: Mechanistic investigations and monolithic electropromoted reactors"
Catalysis Today, 100 (2005) 133

- P6. A. *Katsaounis*, S. Balomenou, D. Tsiplakides, S. Brosda, S.G. Neophytides and C.G. Vayenas
"Proton tunneling-induced bistability, oscillations and enhanced performance of PEM fuel cells"
Applied Catalysis B: Environmental, 56 (2004) 237
- P5. A. *Katsaounis*, Z. Nikopoulou, X.E. Verykios and C.G. Vayenas
"Comparative isotope-aided investigation of Electrochemical Promotion and Metal-Support Interactions: 2. CO oxidation by $^{18}\text{O}_2$ on electropromoted Pt films deposited on YSZ and on nanodispersed Pt/YSZ catalysts"
Journal of Catalysis, 226 (2004) 197
- P4. S. Balomenou, D. Tsiplakides, A. *Katsaounis*, S. Thiemann-Handler, B. Cramer, G. Foti, Ch. Comninellis and C.G. Vayenas
"Novel monolithic electrochemically promoted catalytic reactor for environmentally important reactions"
Applied Catalysis B: Environmental, 52 (2004) 181
- P3. A. *Katsaounis*, Z. Nikopoulou, X.E. Verykios and C.G. Vayenas
"Comparative isotope-aided investigation of Electrochemical Promotion and Metal-Support Interactions: 1. $^{18}\text{O}_2$ TPD of electropromoted Pt films deposited on YSZ and of dispersed Pt/YSZ catalysts"
Journal of Catalysis, 222 (2004) 192
- P2. F. Tietz, Ch. Papadelis, D. Tsiplakides, A. *Katsaounis* and C.G. Vayenas
"Temperature Programmed Oxygen Desorption of the Perovskites Series $\text{Ln}_{0.65}\text{Sr}_{0.3}\text{Mn}_{0.8}\text{Co}_{0.2}\text{O}_3$ (Ln: La-Gd)"
Ionics, 7 (2001) 101
- P1. C.G. Yiokari, G.E. Pitselis, D.G. Polydoros, A.D. *Katsaounis* and C.G. Vayenas
"High-Pressure Electrochemical Promotion of Ammonia Synthesis over an Industrial Iron Catalyst"
The Journal of Physical Chemistry A, 104 (1999) 10600-10602

- 27-31/08/17 **13th European Congress on Catalysis, Florence, Italy**
1. "Electrochemical promotion of dispersed catalysts supported on anionic and cationic conductors for the hydrogenation reaction of CO₂", M. Makri, I. Kalaitzidou, A. Kotsiras, A. Simmilidis, D. Grigoriou, A. Katsaounis and C.G. Vayenas

2. "Electrochemical promotion of CH₄ oxidation on Pd nanoparticles, Pd/Co₃O₄ and Pd/MnO₂ nanodispersed catalysts deposited on O²⁻ conductors (YSZ, CGO)"
I. Kalaitzidou, D. Zagoraios, S. Ntais, E. Baranova, S. Brosda, A. Katsaounis, P. Vernoux and C.G. Vayenas
- 21-26/08/16 **67th Annual Meeting of the International Society of Electrochemistry, The Hague, The Netherlands**
1. "Electrochemical Promotion of CO₂ Hydrogenation on Ru catalysts deposited on Na⁺, K⁺, H⁺ and O²⁻-conducting solid electrolytes"
I. Kalaitzidou, M. Makri, D. Theleritis, A. Katsaounis and C.G. Vayenas

2. "Electrochemical promotion of hydrogen oxidation on Pt/C in aqueous alkaline media", B. Hasa, M. Athanasiou, J. Vakros, A. Katsaounis, C. Vayenas
- 21-24/10/15 **European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP4), Athens, Greece**
1. "Study of methanol reforming using differential electrochemical mass spectrometry (DEMS)", J. Vakros B. Hasa, A. Katsaounis

2. "J. Vakros, A. Katsaounis «Study of hydrogen oxidation using Differential Electrochemical Mass Spectrometry (DEMS)", J. Vakros, A. Katsaounis
- 04-10/10/14 **226th Meeting of the Electrochemical Society, Cancun, Mexico**
"Enhanced Oxygen Reduction Using Triode Fuel Cells",
C.G. Vayenas, E. Martino, A. Katsaounis
- 28/09-02/10/14 **10th European Symposium on Electrochemical Engineering, Sardinia, Italy**
1. "Kinetic modelling and pathways of anodic oxidation of phenol on Ti/IrO₂ electrode", A. Katsaounis, D. Mantzavinos, N. Kalogerakis

2. "Electrochemical Promotion of the Hydrogenation of CO₂ using anionic, alkaline and protonic conductors: some new phenomena and challenges",
A.Katsaounis, M. Makri, I. Kalaitzidou, D. Theleritis, C.G.Vayenas
- 31/08-05/09/14 **65th Annual Meeting of the International Society of Electrochemistry, Lausanne, Switzerland**
1. "Electrochemical Promotion of CO₂ Hydrogenation on Ru Catalyst- electrodes Deposited on a BZY Proton Conductor", I. Kalaitzidou, A. Katsaounis and C.G. Vayenas

2. "Electrochemical promotion of CO₂ hydrogenation on Ru films deposited on YSZ (O²⁻ conductor) and β"-Al₂O₃ (Na⁺, K⁺ conductor)", D. Theleritis, M. Makri, S. Souentie, A. Katsaounis and C.G. Vayenas

3. "Triode Fuel Cell Operation under CO-poisoning Conditions", E. Martino, A. Gusev, A. Katsaounis and C.G. Vayenas

4. "Effect of TiO₂ Loading on Pt and Pt-Ru Catalysts During Methanol Electrooxidat
Kalamaras, B. Hasa, E. Papaioannou, L. Sygellou and A. Katsaounis

- 01-06/09/13 **3rd European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP3), Chania, Greece**
"Anodic Oxidation of Phenol on Ti/IrO₂ electrode: Modelling Study ", A. Katsaounis, D. Mantzavinos, N. Kalogerakis
- 01-06/09/13 **11th European Congress on Catalysis, EUROPACAT-XI, Lyon, France**
1. "Steady state multiplicities in Low Temperature Fuel Cells", E. Martino, S. Divane, A. Gousev, A. Katsaounis, C.G. Vayenas
2. "CO₂ Hydrogenation Over Electropromoted Metal Catalysts", I. Kalaitzidou, D. Theleritis, S. Souentie, A. Katsaounis, C.G. Vayenas
3. "Electrochemical Promotion of CO₂ hydrogenation on Ru films deposited on β"-Al₂O₃ (Na⁺ conductor)", D. Theleritis, M. Makri, S. Souentie, A. Katsaounis and C.G. Vayenas
- 07-11/07/13 **11th International Conference on Catalysis in Membrane Reactors, Porto, Portugal**
1. "Electrochemical Promotion of CO₂ Hydrogenation on Ru/β"-Al₂O₃ (Na⁺)", M.Makri, D. Theleritis, A. Katsaounis, C.G. Vayenas
2. "CO₂ Hydrogenation Over Ru/YSZ Electropromoted Catalysts in a High Pressure Reactor", D.Theleritis, S. Souentie, A. Katsaounis, C.G. Vayenas
- 12-14/09/12 **3rd International Conference on Industrial and Hazardous Waste Management, Chania, Greece**
"Removal of faecal indicator pathogens from waters and wastewaters by photoelectrocatalytic oxidation on TiO₂/Ti-films under simulated solar radiation", D. Venieri, E. Chatzisyneon, S. Sofianos, E. Politi, N. Xekoukoulotakis, A. Katsaounis and D. Mantzavinos
- 19-24/08/12 **63rd Annual Meeting of the International Society of Electrochemistry, Prague, Czech Republic**
1. "Pt-TiO₂ binary electrodes for electrochemical oxidation of alcohols", E. Papaioannou and A.Katsaounis
2. "Effect of thermal treatment on the electrocatalytic properties of Pt-Ir binary electrodes for DAFC " E. Papaioannou and A.Katsaounis
3. "Solar-induced photoelectrocatalytic degradation of bisphenol-A on TiO₂ ITO-film anode and BDD cathode"V. Daskalaki, Z. Frontistis, A. Katsaounis and D. Mantzavinos
4. "Triode operation of CO poisoned PEM fuel cells" S. Divane, A. Gousev, E. Martino, A. Katsaounis and C.G. Vayenas
- 01-06/07/12 **15th International Congress on Catalysis, Munich, Germany**
"CO₂ hydrogenation over Ru electropromoted catalysts", D. Theleritis, S. Souentie, A.Katsaounis and C.G. Vayenas
- 29-30/09/11 **2nd European Symposium on Photocatalysis, Bordeaux, France**
"Removal of fecal indicator pathogens from waters and wastewaters by means of

photoelectrochemical oxidation", V.D.Mantzavinos, E.Chatzisymeon, S.Sofianos, N.Politi, N.Xekoukoulotakis, A.Katsaounis and D.Venieri

- 19-23/06/11 **9th European Symposium on Electrochemical Engineering, Chania, Greece**
1. "BDD anodic oxidation as tertiary wastewater treatment for estrogens and pathogens removal ", C. Brebou, Z. Frontistis, D. Venieri, N.P. Xekoukoulotakis, D. Mantzavinos and A. Katsaounis
2. "Photoelectrochemical disinfection of secondary treated wastewaters", E. Chatzisymeon, S. Sofianos, N. Politi, A. Katsaounis, D. Mantzavinos and D. Venieri
3. "Effectiveness factor of three-dimensional Ti/IrO₂ anodes", G. Foti, E.H. Calderon, A. Katsaounis and Ch. Comninellis
4. "Influence of carbonate on anodic chlorine mediated ammonia oxidation", V. Amstutz, A. Katsaounis, A. Kapalka, K. Udert and Ch. Comninellis
- 5-8/10/10 **2nd International Conference on Hazardous and Industrial Waste Management, Chania, Greece**
1. "Electrochemical degradation of textile effluents by anodic oxidation on boron doped diamond ", T. Velegraki, E. Tsantaki, D. Mantzavinos and A. Katsaounis
2. "Electrochemical degradation of ECDs by anodic oxidation on boron-doped diamonds", Z. Frontistis, C. Brebou, A. Katsaounis and D. Mantzavinos
3. "Electrochemical oxidation of stabilized landfill leachate over DSA[®] electrodes on IrO₂ and RuO₂", A. Giannis, E. Turro, R. Cossu, E. Gidaracos and A. Katsaounis
- 27/9-1/10/10 **61th International Society of Electrochemistry Annual Meeting, Nice, France**
1. "Induced oscillations by NEMCA effect over Rh electrochemical catalyst", C. Jiménez Borja, A. Nakos, F. Dorado, A. Katsaounis and José Luis Valverde
2. "Electrochemical degradation of Reactive Red 120 using DSA and BDD anodes" T. Panakoulias, P. Kalatzis, D. Kalderis and A. Katsaounis
3. "Ammonia Oxidation to Nitrogen Mediated by Electrogenerated Active Chlorine on Ti/Pt-IrO₂"
A. Katsaounis, A. Kapalka, N.-L. Michels, A. Leonidova, S. Souentie and Ch. Comninellis
- 5-9/07/10 **10th International Protection and Restoration of the environment Conference, Corfu Island, Greece**
"Use of Seawater for electrocatalytic treatment of ethanol distillation byproducts",
. Daskalaki, H. Marakas, D. Mantzavinos, A. Katsaounis, P. Gikas
- 16-21/8/09 **60th International Society of Electrochemistry Annual Meeting, Beijing, China**
"Effectiveness factor of isopropanol oxidation and various redox couples on IrO₂ based electrodes of different loading",
E. Calderon, J. Hahladakis, G. Foti and A. Katsaounis
- 24-28/8/08 **8th European Symposium on Electrochemical Engineering, Prague, Czech Republic**
"Electrochemical Promotion of Catalysis (EPOC)... on the way to explore the mechanism of promotion and develop the next generation of electropromoted reactors"
A. Katsaounis

- 1-3/10/08 **1st International Conference on Hazardous Waste Management, Chania, Greece**
 "Electrochemical oxidation of Olive Mill Wastewater over DSA electrodes based on IrO₂"
 E. Chatzisyneon, A. Dimou, D. Mantzavinos and A. Katsaounis
- 5-7/09/07 **10th International Conference on Environmental Science and Technology, Kos island, Greece**
 "Electrochemical promotion of catalysis (EPOC): Perspectives for application to gas emissions treatment"
 A. Katsaounis
- 26-31/08/07 **Europacat-VIII, Turku/Abo, Finland**
 1. "¹⁸O₂ tracer investigation of the origin of metal-support interactions of Pt supported catalysts".
 A. Katsaounis and C.G. Vayenas
2. "Proton tunneling in PEM fuel cell"
 M. Tsampas, A. Katsaounis and C.G. Vayenas
- 28/08-1/09/05 **Europacat-VII, Sofia, Bulgaria**
 1. "The Role of Potential-Dependent Electrolyte Resistance in the Performance and Steady-state Multiplicities of PEM Fuel Cells".
 A. Katsaounis, M. Tsampas, S.P. Balomenou, D. Tsiplakides and C.G. Vayenas
2. "Monolithic Electrochemically promoted reactors: A step for practical utilization of electrochemical promotion"
 S.P. Balomenou, D. Tsiplakides, **A. Katsaounis**, S. Brosda, G. Foti, Ch. Comninellis, S. Thiemann-Handler, B. Cramer and C.G. Vayenas
3. "The effect of membrane thickness, potential and gas composition on the conductivity of Nafion: Experiment and Theory"
 M. Tsampas, A. Picos, **A. Katsaounis**, S. Brosda and C.G. Vayenas
4. "The effect of film thickness on the Electrochemical Promotion of C₂H₄ oxidation on Pt paste films deposited on YSZ"
 C. Koutsodontis, **A. Katsaounis** and C.G. Vayenas
5. "Oxygen ion mobility and its influence on chemisorptive and kinetic parameters"
 Z. Nikopoulou, **A. Katsaounis**, C.G. Vayenas and X.E. Verykios
- 17-22/07/05 **SSI-15 International Conference on Solid State Ionics, Baden-Baden, Germany**
 1. "The Role of Potential-Dependent Electrolyte Resistance in the Performance and Steady-state Multiplicities of PEM Fuel Cells".
 A. Katsaounis, M. Tsampas, S.P. Balomenou, D. Tsiplakides and C.G. Vayenas
2. "Monolithic Electrochemically promoted reactors: A step for practical utilization of electrochemical promotion"
 S.P. Balomenou, D. Tsiplakides, A. Katsaounis, S. Brosda, G. Foti, Ch. Comninellis, S. Thiemann-Handler, B. Cramer and C.G. Vayenas
3. "The effect of membrane thickness, potential and gas composition on the conductivity of Nafion: Experiment and Theory"
 M. Tsampas, A. Picos, A. Katsaounis, S. Brosda and C.G. Vayenas
4. The effect of film thickness on the Electrochemical Promotion of C₂H₄ oxidation on Pt paste films deposited on YSZ"
 C. Koutsodontis, A. Katsaounis and C.G. Vayenas

- 15-20/05/05 **207th Meeting of The Electrochemical Society, Quebec City, Canada**
 “The Role of Potential-Dependent Electrolyte Resistance in the Performance and Steady-state Multiplicities of PEM Fuel Cells”
 A. Katsaounis, M. Tsampas, S.P Balomenou, D. Tsiplakides and CG Vayenas
- 26-28/01/05 **First Conference of the European Union Coordination Action “CO-ordination of Nanostructured Catalytic Oxides Research and Development in Europe”:**
CONCORDE, Louvain-la-Neuve, Begium
 “Oxygen ion mobility in metal oxides used as catalysts or catalyst carriers”
 Z. Nikopoulou, A. Katsaounis, C.G. Vayenas and XE Verykios
- 19-24/09/04 **55th Annual Meeting of International Society of Electrochemistry, Thessaloniki, Greece**
 1. “Monolithic Electrochemically Promoted Reactor: A Step for Practical Utilization of Electrochemical Promotion”
 S.P. Balomenou, D. Tsiplakides, A. Katsaounis, S. Brosda, G. Fóti, Ch. Comninellis, S. Thiemann-Handler, B. Cramer and C.G. Vayenas
 2. “Electrochemical promotion of ethylene oxidation on thick Rh and Pt films deposited on a YSZ plate in a MEP reactor”
 S.P. Balomenou, D. Tsiplakides, A. Katsaounis, S. Poulston, V. Houel, S. Thiemann-Handler, B. Cramer and C.G. Vayenas
 3. “¹⁸O₂ isotope investigation of electrocatalysis and electropromotion in solid electrolyte cells”
 A. Katsaounis and C.G. Vayenas
 4. “Electrochemical promotion of oxidation reactions and NO reduction on Pt and Rh catalyst electrodes”
 C. Koutsodontis, I. Constantinou, A. Katsaounis, D. Tsiplakides and C.G. Vayenas
 5. “The Role of potential-dependent electrolyte resistance in the performance ad steady state multiplicities of PEM fuel cells.”
 A. Katsaounis, S.P. Balomenou, D. Tsiplakides and C.G. Vayenas
- 11-16/07/04 **13th International Congress on Catalysis, Paris, France**
 1. “Electrochemical promotion and metal-support Interactions with O²⁻ conducting supports: Size effects and modeling of the role of O²⁻ spillover”
 S. Balomenou, A. Katsaounis and C.G. Vayenas
 2. “Isotope Tracer and STM Investigation of the Origin of Electrochemical Promotion of Catalysis and of Metal-Support Interactions”
 A. Katsaounis, D. Archonta and C.G. Vayenas
- 16-21/05/04 **10th Int. Conference. on Properties and Phase Equilibria for Product and Process Design (PPEPPD), Snowbird, Utah, U.S.A.**
 “Thermodynamics and adsorbed species and the double layer approach to catalysis”
 C.G. Vayenas (invited), C. Pliangos, C. Brosda, A. Katsaounis and D. Tsiplakides
- 16-21/11/03 **Annual Meeting of AIChE, San Francisco, USA**
 1. “Isotope tracer investigation of the origin of electrochemical promotion of catalysis”
 A. Katsaounis and C.G. Vayenas
 2. “¹⁸O₂ tracer investigation of the origin of metal-support interactions”
 A. Katsaounis, Th. Halkides, X.E. Verykios and C.G. Vayenas

- 30/8-05/9/03 **54th Annual Meeting of International Society of Electrochemistry, São Pedro, Brazil**
"Isotope tracer investigation of the origin of electrochemical promotion of catalysis"
A. Katsaounis and C.G. Vayenas
- 16-21/09/02 **9th Euroconference on Science and Technology of Ionics, Ixia, Rhodes, Greece**
"Thermal Desorption Study of Oxygen Adsorption on Pd films deposited on YSZ and β "-Al₂O₃"
A. Katsaounis, D. Tsiplakides and C.G. Vayenas
- 01-08/10/00 **7th Euroconference on Science and Technology of Ionics, Corsica, France**
"Temperature Programmed Oxygen Desorption of the Perovskites Series Ln_{0.65}Sr_{0.3}Mn_{0.8}Co_{0.2}O₃ (Ln=La-Gd)
F. Tietz, Ch. Papadelis, D. Tsiplakides, A. Katsaounis and C.G. Vayenas

*** Υπάρχουν ακόμη συμμετοχές στα περισσότερα από τα παρακάτω ελληνικά συνέδρια (μετά το 2000):**

Πανελλήνιο Συμπόσιο Κατάλυσης

Πανελλήνιο Επιστημονικό συνέδριο Χημικής Μηχανικής

Εθνικό Συνέδριο Τεχνολογιών Υδρογόνου

Πανελλήνιο Συνέδριο Πράσινης Χημείας & Βιώσιμης Ανάπτυξης

ΣΥΝΟΛΙΚΗ ΕΙΚΟΝΑ ΑΡΘΡΩΝ ΣΕ ΕΠΙΣΤΗΜΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ ΜΕ ΚΡΙΤΕΣ

Επιστημονικό Περιοδικό	Αριθμός Δημοσιεύσεων	Δείκτης Απήχησης* (ISI-JCR 2017)
Applied Catalysis B: Environmental	6	11.698
ACS Catalysis	1	11.384
Water Research	2	7.051
Journal of Catalysis	4	6.759
Chemical Engineering Journal	1	6.735
Desalination	1	6.603
Journal of Hazardous Materials	3	6.434
Electrochimica Acta	8	5.116
Catalysis Today	3	4.667
Electrochemistry Communications	2	4.660
ChemElectroChem	1	4.446
International J. of Hydrogen Energy	1	4.229
Journal of Environmental Management	2	4.005
Electrocatalysis	1	2.889
The Journal of Physical Chemistry A	1	2.836
Environ. Science & Pollution Research	1	2.800
Solid State Ionics	2	2.751
J Chem Technology & Biotechnology	2	2.587
Topics in Catalysis	3	2.439
Ionics	1	2.347
Journal of Applied Electrochemistry	6	2.262
Surface Science	1	1.997
Chemical Physics Letters	1	1.686
J Water and Health	1	1.352
Water Science and Technology	1	1.247
Materials Today: Proceedings	3	0.940
International Journal of Structural Integrity	1	0.700
Global NEST Journal	1	0.665
Σύνολο	61	

* Στοιχεία Δείκτη Απήχησης (Impact Factor) του ISI-Journal Citation Reports (JCR), 2017.

Συνολικός αριθμός άρθρων σε ISI περιοδικά (δημοσιευμένων):	61
Συνολικός αριθμός κεφαλαίων σε βιβλία (διεθνή/ελληνικά):	4 / 1
Σύνολο αναφορών (πηγή: google scholar):	1814
h-index (πηγή: google scholar με βάση τις ετεροαναφορές):	28
i-10 index (πηγή: google scholar με βάση τις ετεροαναφορές):	39
Συνολικός αριθμός εργασιών ως corresponding author	22

Ενημέρωση Ιούλιος 2018

ΚΑΤΗΓΟΡΙΟΠΟΙΗΣΗ ΕΡΕΥΝΗΤΙΚΟΥ ΕΡΓΟΥ ΚΑΙ ΠΕΡΙΛΗΨΕΙΣ ΔΗΜΟΣΙΕΥΜΕΝΩΝ ΕΡΓΑΣΙΩΝ

Το δημοσιευμένο μου έργο κινείται στις παρακάτω ερευνητικές περιοχές:

- A. Κυψελίδες καυσίμου (λειτουργία, απόδοση, ηλεκτρόδια κ.λ.π.)
(εργασίες P 2, 6, 8-9, 13, 15, 43-45, 48, 52, 54, 58, 61)
- B. Χρήση της ηλεκτροκατάλυσης για την επεξεργασία αέριων ρύπων και παραγωγής καυσίμων – Μελέτη του μηχανισμού του φαινομένου NEMCA και αλληλεπιδράσεις φορέα μετάλλου
(εργασίες P 1, 3-5, 7, 10-11, 14, 16-17, 24, 28, 37-38, 46, 47, 49, 50, 56, 57, 59, 60, 62)
- Γ. Παρασκευή, χαρακτηρισμός και μελέτη καινοτόμων ανοδικών ηλεκτροδίων για την ηλεκτροχημική / φωτοηλεκτροχημική οξειδωση οργανικών ενώσεων σε υγρά μέσα
(εργασίες P 18-23, 25-27, 29-36, 39-42, 51, 53)
- Δ. Άλλες περιοχές σχετιζόμενες με ηλεκτροχημικές διεργασίες
(εργασία P55: Ηλεκτροχημική διάβρωση υλικών)

Παρακάτω παρατίθενται οι περιλήψεις των εργασιών όπως αυτές είναι δημοσιευμένες στα διάφορα περιοδικά.

P62. "Study of the electrochemical promotion of methane oxidation in Pd catalysts supported on YSZ ", *Materials Today: Proceedings* (2018), in press.

Studies on CH₄ oxidation are of special interest due to the difficulty in activating this particular hydrocarbon, due to the demand of an active catalyst at low temperatures (T₅₀ at 300°C) as well as due to possible deactivation of the catalyst upon exposure at high temperatures. To address these issues, we used Electrochemical Promotion of Catalysis (EPOC), which was discovered in the early 80's and has been studied for more than 100 catalytic systems. EPOC allows for the controlled enhancement of the catalytic activity by potential or small current application between a catalyst (working electrode) supported on a solid electrolyte and an auxiliary electrode. In this study, Pd nanoparticles (2-4 nm) deposited on O²⁻ conductor (YSZ) was used to study the electrochemical promotion of methane oxidation. It was found that EPOC could be used to promote nanodispersed catalysts and enhance the reaction rate at temperatures lower than those that have been observed in previous studies.

P61. "Study of low temperature alcohol electro-reforming", *Materials Today: Proceedings* (2018), in press.

The electrochemical reforming of two alcohols using electrochemical mass spectrometry (EMS) was studied on a Pt-SnO₂ anodic electrode. The effect of two parameters, alcohol concentration and temperature, on the cell performance was investigated for the case of methanol and ethanol feeding. It was found that hydrogen production is feasible from methanol with efficiency up to 100%. In both cases, fraction of CO₂ and other side-products diffuses from anode to cathode. In addition, alcohol crossover through the membrane is taking place during the electrolysis process.

P60. "Electrochemical Promotion of CO₂ reduction on a dispersed Ru/YSZ catalyst supported on YSZ solid electrolyte", *Materials Today: Proceedings (2018)*, in press.

The utilization processes of CO₂ are of great potential environmental and industrial importance as they can contribute to the reduction of its emissions to the atmosphere. When co-feeding CO₂ and H₂ over a hydrogenation catalyst there are two main processes that can take place: the production of CO (RWGS) and a synthesis reaction leading to the formation of hydrocarbons and/or alcohols. In the studies of Electrochemical Promotion the conductive electrode-catalyst is in contact with an ionic conductor and it is promoted by the application of a potential or current between the catalyst and a counter electrode [1]. In this study, the Electrochemical Promotion of Catalysis (EPOC) was used to modify the activity and selectivity of a dispersed catalyst 2% Ru/YSZ powder catalyst deposited on an O²⁻ solid electrolyte conductor (YSZ) disk. The experiments were carried out at temperatures 280-380°C and atmospheric pressure. The reaction products were CO and CH₄, both under open circuit and polarization conditions. It was found that the selectivity of CH₄ increases (from 20% to 60%) with the loading of the nanodispersed catalyst. In all cases, positive potential enhances methane production whereas negative one enhances the production of CO. The results are in agreement with the rules of Electrochemical Promotion of Catalysis.

P59. "The effect of polarization and reaction mixture on the Rh/YSZ oxidation state during ethylene oxidation studied by Near Ambient Pressure XPS", *Topics in Catalysis (2018)* in press

In this study, near ambient pressure X-ray photoelectron spectroscopy (NAP-XPS) is applied to investigate an electrochemical cell consisting of a rhodium thin film catalyst supported on an YSZ solid electrolyte under various ethylene-oxygen reaction mixtures. The aim of the study is twofold: first to show how the surface oxidation state of the Rh catalyst is correlated with the reactants feed composition and the temperature, and second, to reveal the effect of the anodic polarization on the stability of Rh oxides and the implications on the electrochemical promotion of catalysis. It is clearly shown that even under reducing conditions part of the Rh electrode remains oxidized at temperatures up to 250°C. Reduction of the oxide can take place by increasing the temperature under C₂H₄ excess, something which is not happening under oxidizing reaction mixtures. Moreover, anodic polarization, i.e. oxygen ion supply to the surface, facilitates reduction of oxidized Rh electrodes over a broad range of ethylene-oxygen reaction mixtures. Remarkably, under mildly reducing conditions a stable ultrathin Rh surface oxide film forms over metallic Rh. This surface Rh oxide film (RhO_x) is associated to higher cell currents, counterintuitive to the case of bulk Rh oxides (Rh₂O₃).

P58. "Effect of TiO₂ on Pt-Ru-based anodes for methanol electroreforming", *Applied Catalysis B: Environmental*, 237 (2018) 811-816

This study examines the electrochemical reforming of methanol for hydrogen production using novel DSA type anodes (modified with TiO₂) with low metal loadings. Mass spectrometry (MS) in conjunction with electrochemical techniques were used to study the performance of the process as well as crossover phenomena. The electrolysis process was carried out in a Polymer Electrode Membrane (PEM) electrolyzer comprised of a Pt-Ru modified with TiO₂ anode, a commercial Pt/C cathode, and a Nafion 117 electrolyte. Both methanol concentration and cell temperature were varied to investigate the cell performance. In all cases, our results showed that the Pt-Ru-TiO₂ electrode had better electro-catalytic activity than the Pt-Ru electrode. This higher electrocatalytic activity of the TiO₂-modified electrode was attributed to the enhanced Pt-Ru dispersion as well as the formation of smaller Pt and Ru particles, and thus to the higher electrochemical active surface. For all studied Membrane Electrodes Assemblies (MEAs), both CO₂ and methanol crossover were observed at the cathode of the cell. In addition, it was found that hydrogen production is taking place with Faradaic efficiency values very close to 100%. This study demonstrates that the TiO₂-modified electrode with a decreased noble-metal loading can increase the current density up to 56%.

P57. "Electrochemical promotion of nanodispersed Ru-Co catalysts for the hydrogenation of CO₂", Applied Catalysis B: Environmental, 232 (2018) 60-68

Electrochemical promotion of the CO₂ hydrogenation to CH₄ and CO on a nanodispersed Ru-Co catalyst has been achieved via slurry deposition of the nanodispersed catalyst on an interlayer Ru film deposited on a BZY (BaZr_{0.85}Y_{0.15}O₃) proton conducting solid electrolyte disc. The effect of current is non-Faradaic, with Faradaic efficiency values as high as 60 and leads to a reversible variation of the selectivity to CH₄ between 16% and 41%. Due to thermal spillover of protons on the Ru-Co catalyst surface, the open circuit selectivity to CO is quite high, i.e. up to 84% and similar values are obtained via negative potential application, i.e. proton supply to the Ru catalyst film deposited on BZY before the deposition of the nanodispersed catalyst. These results underline the similarity between electrochemical promotion and metal support interactions when using proton conducting supports. They also show the usefulness of electrochemical promotion for mechanistic investigations. The electrochemical promotion of nanodispersed catalysts is a promising step for the practical utilization of electrochemical promotion.

P56. "Electrochemical promotion of carbon supported Pt, Rh and Pd catalysts for H₂ oxidation in aqueous alkaline media", J. Chem. Technol. Biotechnol. 93(6) (2018) 1542-1548

The effect of electrochemical promotion of catalysis (EPOC) for the case of H₂ oxidation reaction over commercial M (M=Pt, Rh, Pd)/Vulcan XC72 (EOTEK) electrodes immersed in alkaline media was explored in this study. Various reactant mixtures (H₂ and O₂) fed simultaneously through a glass frit to the anodic electrode which was immersed in the electrolyte. Both positive and negative currents were applied between anode and cathode while all the reactants were followed by mass spectrometry. In the case of Pt electrode, it was found that application of small positive currents resulted in a reversible enhancement of both oxygen and hydrogen consumption rate, higher than the expected Faradaic one (I/2F). Pd and Rh electrodes exhibited lower catalytic activity at ambient temperature while positive current applications induced an acceleration of the catalytic reaction. Interestingly, modification of the catalytic activity of Pd and Rh electrodes was found to be irreversible even under negative current applications. Commercially available, carbon supported metal (Pt, Rh, Pd) catalysts, can be electrochemically promoted during hydrogen oxidation reaction in alkaline media. The rate enhancement could be explained by modification of the work function of the catalytic surface (thus the strength of the reactant's adsorption bond) during potential or current application as well as modification of the catalyst surface.

P55. "Resistance and Mechanical Characteristics of dual-phase steel B500c, after shot blasting processes", International Journal of Structural Integrity 8(5) (2017) 544-564

Corrosive agent constitutes a major problem for constructions located in coastal areas, since it keeps affecting their durability. This phenomenon, in synergy with moisture and high temperatures, leads to premature deterioration of the structures. Under these conditions, the need for management of the problem of resistance of steel against corrosion is an issue of paramount importance and a challenge to the structural integrity and reliability. The paper aims to discuss these issues. The need for management of the problem of resistance of steel against corrosion is an issue of paramount importance and a challenge to the structural integrity and reliability. In the present study, an effort was made to increase the corrosion resistance of the high strength and ductility dual-phase steel B500c category, with the use of different shot blasting processes, without any interference in the chemical composition or in the production mode. In particular, shot blasting treatment was used for both cleaning and creating compressive stresses on the surface of steel bars, according to the pertinent protocols. The modified samples were studied via both conventional characterization methods and electrochemical techniques. Through the whole surface treatment process of B500c steel, a positive impact came about not only the corrosion resistance, but also the mechanical performance. Shot blasting process aims to increase the corrosion resistance of high ductility dual phase steel (B500c), without any interference in the chemical composition or in the production mode.

P54. "Experimental investigation and mathematical modeling of triode PEM fuel cells", *Electrochimica Acta* 248 (2017) 518-533.

The triode operation of humidified PEM fuel cells has been investigated both with pure H₂ and with CO poisoned H₂ feed over commercial Vulcan supported Pt(30%)-Ru(15%) anodes. It was found that triode operation, which involves the use of a third, auxiliary, electrode, leads to up to 400% power output increase with the same CO poisoned H₂ gas feed. At low current densities, the power increase is accompanied by an increase in overall thermodynamic efficiency. A mathematical model, based on Kirchhoff's laws, has been developed which is in reasonably good agreement with the experimental results. In order to gain some additional insight into the mechanism of triode operation, the model has been also extended to describe the potential distribution inside the Nafion membrane via the numerical solution of the Nernst-Planck equation. Both model and experiment have shown the critical role of minimizing the auxiliary-anode or auxiliary-cathode resistance, and this has led to improved comb-shaped anode or cathode electrode geometries.

P53. "Electrochemical treatment of biologically pre-treated dairy wastewater using dimensionally stable anodes", *Journal of Environmental Management* 202 (2017) 217-224

In this work, electrochemical oxidation of aerobically pre-treated dairy wastewaters using IrO₂-Pt coated dimensionally stable anodes was investigated. It was found that IrO₂/Ti electrode outperforming Pt/Ti and IrO₂-Pt/Ti at lower current densities, while Pt/Ti achieved better efficiency at higher current density. Among the different parameters which were studied, the current density was the most crucial for the efficiency of the process. A current density of 100 mA/cm² led to almost complete removal of 3700 mg/L COD after 360 min of treatment using IrO₂/Ti electrode and 0.2 M of sodium chloride while complete decolorization was achieved in less than 60 min. Electrolytes also found to significantly affect the process. More specific, the use of sodium chloride instead of sodium sulfate enhanced both COD and color removal due to the formation of active chlorine species. The effect of temperature was relative low; the process was favourable at elevated temperatures while increasing COD loading resulted in a decrease of COD and color removal.

P52. "Investigation of advanced components in a high pressure single cell electrolyser for the development of a HP-ELY stack as part of a regenerative fuel cell system", *E3S Web of Conferences* 16 (2017) 09004

The objective of the presented work, done under current ESA activity (Contract No. 4000109578/13/NL/SC), is the performance and tolerance evaluation of selected components and materials for the development of a High Pressure, Polymer Electrolyte Membrane (PEM) Electrolyser (HP-PEM-ELY) Stack, aiming to operate at 80 bar with a performance output of 0.3 A/cm² at 1.6 V. An extensive study was performed on a single-cell high pressure PEM electrolyser manifold, leading to a list of materials with suitable properties and engineering solutions towards operation in space environment. This investigation provided the necessary feedback for the design of a HP-PEM-ELY stack, which is also discussed. The ultimate target of the current ESA activity is to implement research findings, develop and operate a complete regenerative fuel cell system, comprising of a High Temperature Fuel Cell Stack and the HP-PE

P51. "Boron-doped diamond electrooxidation of ethyl paraben: The effect of electrolyte on by-products distribution and mechanisms", *Journal of Environmental Management*, 195 (2017) 148-156

Ethyl paraben (EP), a representative emerging pollutant of the parabens family, was subject to electrochemical oxidation over a boron-doped diamond (BDD) anode. Experiments were carried out in a single compartment cell at 10-70 mA/cm² current density, 200-600 mg/L EP concentration, initial solution pH 3-9 and 0.1 M electrolyte concentration. The degradation rate is favored at

increased current densities and in the presence of NaCl as the supporting electrolyte, while the pH effect is inconsiderable. For instance, the first order rate constant for the degradation of 200 mgL⁻¹ EP at 30 mAcm⁻² was 0.25, 0.1 and 0.07 min⁻¹ with NaCl, Na₂SO₄ and HClO₄, respectively. Degradation in secondary treated wastewater was faster than in pure water presumably due to the action of chloride ions present in the effluent. Liquid chromatography time-of-flight mass spectrometry (LC-TOF-MS) was employed to determine major transformation by-products (TBPs). The route of EP degradation with Na₂SO₄ involves hydroxylation and demethylation reactions, signifying the role of electrogenerated hydroxyl radicals in the process. Twenty one TBPs were identified with NaCl as the electrolyte, including several chlorinated and non-chlorinated dimers and trimers; these findings suggest that indirect oxidation mediated by chlorine radicals and other chlorine active species also takes place. In this view, the role of the supporting electrolyte is crucial since it can influence both reaction kinetics and pathways.

P50. "Comparative study of the electrochemical promotion of CO₂ hydrogenation on Ru using Na⁺, K⁺, H⁺ and O²⁻ conducting solid electrolytes", Surface Science, 646 (2016) 194-203

The kinetics and the electrochemical promotion of the hydrogenation of CO₂ to CH₄ and CO are compared for Ru porous catalyst films deposited on Na⁺, K⁺, H⁺ and O²⁻ conducting solid electrolyte supports. It is found that in all four cases increasing catalyst potential and work function enhances the methanation rate and selectivity. Also in all four cases the rate is positive order in H₂ and exhibits a maximum with respect to CO₂. At the same time the reverse water gas shift reaction (RWGS) which occurs in parallel exhibits a maximum with increasing p_{H₂} and is positive order in CO₂. Also in all cases the selectivity to CH₄ increases with increasing p_{H₂} and decreases with increasing p_{CO₂}. These results provide a lucid demonstration of the rules of chemical and electrochemical promotion which imply that $(\partial r/\partial \Phi)(\partial r/\partial p_D) > 0$ and $(\partial r/\partial \Phi)(\partial r/\partial p_A) < 0$, where r denotes a catalytic rate, Φ is the catalyst work function and p_D and p_A denote the electron donor and electron acceptor reactant partial pressures respectively.

P49. "Electrochemical Promotion of CO₂ hydrogenation on Ru catalyst-electrodes supported on β -Al₂O₃(K⁺) solid electrolyte", Electrochimica Acta, 179 (2015) 556-564

The electrochemical promotion of the hydrogenation of CO on porous Ru catalyst-electrodes supported on β -Al₂O₃, a K⁺ conductor, was investigated at temperatures 280°C to 420°C and atmospheric total pressure. Methane and CO were the only detectable products and the selectivity to CH₄ was varied reversibly between 0.01 and 98% by varying the catalyst potential between -0.8 V and 0.4 V, which corresponds to a change in the K⁺ coverage on the catalyst surface between 0.32 and zero. The rate of CO formation increases monotonically with increasing K⁺ coverage θ_{K^+} , and thus with decreasing potential, i.e. it exhibits electrophilic behavior, while the rate of CH₄ formation is an overall decreasing function of θ_{K^+} , i.e. it exhibits electrophobic behavior. However, for lower temperatures the methanation rate exhibits a local maximum at intermediate θ_{K^+} and potential values, exhibiting volcano-type behavior. This minimum shifts to lower potentials with increasing hydrogen partial pressure and increasing temperature. The results are in very good agreement with the rules of electrochemical and classical promotion.

P48. "Effect of TiO₂ Loading on Pt-Ru catalysts during methanol electrooxidation", Electrochimica Acta, 179 (2015) 578-587

In this study, Pt-Ru based electrodes modified by TiO₂ were prepared by means of thermal decomposition of chloride and isopropoxide precursors on Ti substrates, characterised by X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), electrochemical techniques and CO stripping and used as anodes for alcohol oxidation. The minimization of the metal loading without electrocatalytic activity losses was also explored. TiO₂ was chosen due to its chemical stability, low cost and excellent properties as substrate for metal

dispersion. It was found that TiO_2 loading up to 50% results in a 3-fold increase of the Electrochemically Active Surface (EAS). This conclusion has been confirmed by CO stripping experiments. All samples have been evaluated during the electrochemical oxidation of methanol, ethanol and glycerol. In all cases, the Pt25-Ru25-(TiO_2)50 electrode had better electrocatalytic activity than the pure Pt50-Ru50 anode. The best modified electrode, (Pt25-Ru25-(TiO_2)50), was also evaluated as anode in a PEM fuel cell under methanol fuelling conditions. The observed higher performance of the TiO_2 modified electrodes was attributed to the enhanced Pt-Ru dispersion as well as the formation of smaller Pt and Ru particles.

P47. "Electrochemical Promotion of the hydrogenation of CO_2 on Ru deposited on a BZY proton conductor", Journal of Catalysis, 331 (2015) 98-109

The electrochemical promotion of the hydrogenation of CO_2 on polycrystalline Ru deposited on a BZY ($\text{BaZr}_{0.85}\text{Y}_{0.15}\text{O}_3 + 1\text{wt}\% \text{NiO}$), a proton conductor in wet atmospheres, was investigated at temperatures 350 to 450°C and atmospheric pressure. Methane and CO were the only detectable products. It was found that the selectivity to CH_4 is very significantly enhanced by proton removal from the catalyst via electrochemically controlled spillover of atomic H from the catalyst surface to the proton-conducting support. The apparent Faradaic efficiency of the process takes values up to 500 and depends strongly on the porous Ru catalyst film thickness. The results strongly suggest that the observed strong promotional effect is due to the formation and surface migration of a promoting formate anion generated via potential controlled disproportionation of formic acid adsorbed at the catalyst-proton conducting support interface. This is the first successful electrochemical promotion study of a hydrogenation reaction at temperatures as low as 350°C. There is an up to fourfold enhancement in catalytic rate of CH_4 formation with concomitant 50% suppression of the CO formation rate which proceeds in a parallel route.

P46. "Comparative study of the electrochemical promotion of CO_2 hydrogenation over Ru supported catalysts using electronegative and electropositive promoters", ChemElectroChem, 1 (2014) 254–262

The kinetics and the electrochemical promotion of the hydrogenation of CO_2 over Ru-catalyst electrodes deposited on yttria-stabilized zirconia (YSZ) and (Na^+)- β - Al_2O_3 solid electrolytes are investigated at temperatures between 200 and 340°C and pressures up to 5 bar. In the case of both the O^{2-} conductor (YSZ) and the Na^+ conductor (β - Al_2O_3), the selectivity for CH_4 production is enhanced significantly when using a positive potential by supplying of O^{2-} to, or removal of Na^+ from, the catalyst surface. The opposite effect is observed when using a negative applied potential, which suppresses CH_4 formation and enhances the production of CO through the reverse water-gas shift reaction. However, at low Na coverage, and under reducing conditions, both methanation and H_2 production are promoted by the application of a negative potential. The observed electrochemical promotion behavior in conjunction with the reaction kinetics is consistent with the rules of electrochemical and chemical promotion.

P45. "Pt-Ir binary electrodes for direct oxidation of methanol in low temperature fuel cells (DMFCs)", ElectroCatalysis 4 (2013) 375-381

In this study, Pt-Ir binary electrodes were prepared by DC magnetron sputtering and characterized by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), electrochemical techniques, and CO stripping. The effect of Ir loading in electrocatalytic activity was also explored. It was found that Ir doping up to 80 % resulted in an increase of the electrochemically active surface (EAS) area and better electrocatalytic performance toward methanol electrooxidation reaction (MOR). The above conclusion was confirmed by CO stripping experiments as well as during oxidation of methanol where the electrodes were used as anodes in a one-compartment cell. The electrode with the lower Pt loading (i.e., 20 %) exhibited better electrocatalytic activity than the pure Pt anode. The observed higher performances of Ir loading electrodes were attributed to the enhanced

P44. “Electrochemical oxidation of alcohols on Pt-TiO₂ binary electrodes”, International Journal of Hydrogen Energy, 38 (2013) 15395-15404

In this study Pt-TiO₂ binary electrodes were prepared by means of thermal decomposition of chloride precursors on Ti substrates, characterised by X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), electrochemical techniques and CO stripping and used as anodes for alcohol oxidation. The minimization of the Pt loading without electrocatalytic activity losses was also explored. TiO₂ was chosen due to its chemical stability, low cost and excellent properties as substrate for Pt dispersion. It was found that TiO₂ loading up to 50% results in Electrochemically Active Surface (EAS) increase. The EAS of Pt(50%)-TiO₂(50%) was found to be almost one order of magnitude higher than that of pure Pt while the EAS of samples with Pt loading lower than 30% was negligible. The above conclusion has been confirmed both by following the charge of the reduction peak of platinum oxide and by CO stripping experiments. All samples have been evaluated during the electrochemical oxidation of methanol and ethanol. In both cases the Pt(50%)-TiO₂(50%) electrode had better electrocatalytic activity than the pure Pt anode. The observed higher performance of the binary electrodes was mainly attributed to the enhanced Pt dispersion as well as the formation of smaller Pt particles by the addition of TiO₂.

P43. “Mathematical modeling of Ni/GDC and Au–Ni/GDC SOFC anodes performance under internal methane steam reforming conditions”, Journal of Catalysis 306 (2013) 116-128

A simple kinetic model has been developed to describe the catalytic and electrocatalytic performance of Ni/GDC and Au–Ni/GDC anodes of SOFCs operating under internal methane-steam reforming reaction conditions, at low and high steam-to-carbon ratio values. The model accounts for the surface dissociation of CH₄ to form methyl species which then react with H₂O to form CO and H₂. Under fuel cell operation conditions, two cases have been distinguished according to the observed electrochemical behavior; the high and the low steam-to-carbon ratio feed conditions. The former is characterized by electrochemical consumption of H₂ and CO, produced by internal CH₄ steam reforming, while the latter by electrochemical partial oxidation of CH₄, to form H₂ and CO, and oxidation of H₂. Interestingly, the coverage of methyl-type species of the catalyst surface, as extracted from the model and the catalytic kinetic data, was found to coincide with the methyl species coverage at the three-phase boundaries, as extracted from the electrocatalytic experiments. The model is in good agreement with experiment under both open-circuit and fuel cell operation conditions.

P42. “Use of seawater for the Boron-doped diamond electrochemical treatment of diluted vinasse wastewater”, Water Science and Technology 68 (2013) 2344–2350

Vinasse wastewater of high organic content (COD=131,000 mg/L) and low biodegradability (BOD₅/COD=0.11) cannot be easily managed and usually require several consecutive treatment steps. The objective of this work was to dilute vinasse wastewater with seawater and then subject them to electrochemical oxidation over boron-doped diamond (BDD) electrodes. The use of seawater is a rational and novel approach for plants close to the seashore since it may achieve the desirable levels of effluent concentration and conductivity without consuming other water resources and extra electrolytes. Experiments were conducted at initial COD values of 830–8,400 mg/L, NaCl concentrations of 34–200 mM and current densities of 70–200 mA/cm² for up to 5 hours. The effect of current density and NaCl concentration was marginal on the electrochemical treatment, while the single most important parameter was the initial COD concentration. The order of reaction for COD reduction appears to be ‘first’ at low effluent concentrations and it decreases to ‘zero’ at higher concentrations, denoting the importance of the ratio of organics to reactive radicals concentration. Based on COD and total organic carbon data, it is postulated that degradation

occurs predominantly through total oxidation (i.e. mineralization) to carbon dioxide and water, which is characteristic of BDD anodes.

P41. "Photoelectrocatalytic disinfection of water and wastewater: performance evaluation by qPCR and culture techniques", Journal of Water and Health 11 (2013) 21-29

Photoelectrocatalytic oxidation (PEC) was evaluated as a disinfection technique using water and secondary treated wastewater spiked with Escherichia coli and Enterococcus faecalis. PEC experiments were carried out using a TiO₂/Ti-film anode and a zirconium cathode under simulated solar radiation. Bacterial inactivation was monitored by culture and quantitative polymerase chain reaction (qPCR). Inactivation rates were enhanced when the duration of the treatment was prolonged and when the bacterial density and the complexity of the water matrix were decreased. E. coli cells were reduced by approximately 6 orders of magnitude after 15 min of PEC treatment in water at 2V of applied potential and an initial concentration of 10⁷ CFU/mL; pure photocatalysis (PC) led to about 5 log reduction, while electrochemical oxidation alone resulted in negligible inactivation. The superiority of PEC relative to PC can be attributed to a more efficient separation of the photogenerated charge carriers. Regarding disinfection in mixed bacterial suspensions, E. coli was more susceptible than E. faecalis at a potential of 2V. The complex composition of wastewater affected disinfection efficiency, yielding lower inactivation rates compared to water treatment. qPCR yielded lower inactivation rates at longer treatment times than culture techniques, presumably due to the fact that the latter do not take into account the viable but not culturable state of microorganisms.

P40. "Removal of faecal indicator pathogens from waters and wastewaters by photoelectrocatalytic oxidation on TiO₂/Ti-films under simulated solar radiation", Environmental Science & Pollution Research 19 (2012) 3782–3790

The disinfection efficiency of water and secondary treated wastewater by means of photoelectrocatalytic oxidation (PEC) using reference strains of Enterococcus faecalis and Escherichia coli as faecal indicators was evaluated. Operating parameters such as applied potential (2–10 V), initial bacterial concentration (10³–10⁷ CFU/mL), treatment time (up to 90 min) and aqueous matrix (pure water and treated effluent) were assessed concerning their impact on disinfection. Methods PEC experiments were carried out using a TiO₂/Ti film anode and a zirconium cathode in the presence of simulated solar radiation. Bacterial inactivation was monitored by the culture method and real-time SYBR green PCR. A 6.2 log reduction in E. faecalis population was achieved after 15 min of PEC treatment in water at 10 V of applied potential and an initial concentration of 10⁷ CFU/ mL; pure photocatalysis (PC) led to only about 4.3 log reduction, whilst negligible inactivation was recorded when the respective electrochemical oxidation process was applied (i.e. without radiation). PEC efficiency was generally improved increasing the applied potential and decreasing initial bacterial concentration. Regarding real wastewater, E. coli was more susceptible than E. faecalis during treatment at a potential of 5 V. Wastewater disinfection was affected by its complex composition and the contained mixed bacterial populations, yielding lower inactivation rates compared to water treatment. Screening the results obtained from both applied techniques (culture method and real-time PCR), there was a discrepancy regarding the recorded time periods of total bacterial inactivation, with qPCR revealing longer periods for complete bacterial reduction. PEC is superior to PC in terms of E. faecalis inactivation presumably due to a more efficient separation and utilization of the photogenerated charge carriers, and it is mainly affected by the applied potential, initial bacterial concentration and the aqueous matrix.

P39. "Effects of carbonate on the electrolytic removal of ammonia and urea from urine with thermally prepared IrO₂ electrodes", Journal of Applied Electrochemistry 42 (2012) 787-795

Recent studies have shown that electrolysis can be an efficient process for nitrogen removal from urine. These studies have been conducted with urea solutions or fresh urine, but urine collected in NoMix toilets and urinals has a substantially different composition, because bacteria hydrolyse urea quickly to ammonia and carbonate. In this study, we compared electrochemical removal of nitrogen from synthetic solutions of fresh and stored urine using IrO₂ anodes. We could show that in fresh urine both ammonia and urea are efficiently eliminated, mainly through chlorine-mediated oxidation. However, in stored urine the presence of carbonate, arising from urea hydrolysis, leads to an inhibition of ammonia oxidation. We suggest two parallel mechanisms to explain this effect: the competition between chloride and carbonate oxidation at the anode and the competition between chlorate formation, enhanced by the buffering effect of carbonate, and ammonia oxidation for the consumption of active chlorine in the bulk. However, further experiments are needed to support the latter mechanism. In conclusion, this study highlights the negative consequences of the presence of carbonate in urine solutions, but also in other wastewaters, when subjected to an electrolytic treatment on IrO₂ in alkaline media.

P38. "Hydrogenation of CO₂ over Ru/YSZ electropromoted catalysts", ACS Catalysis, 2 (2012) 770

The effect of electrochemical promotion of catalysis (EPOC or NEMCA effect) was investigated for the hydrogenation of CO₂ using Ru catalyst electrodes supported on YSZ solid electrolyte pellets at temperatures 200–300°C and ambient pressure. Methane was found to be the main reaction product at temperatures up to 240°C, whereas CO dominated at higher temperatures. It was found that the O²⁻ supply to the Ru surface causes a significant increase in the CH₄ formation rate and selectivity, accompanied by a significant decrease in the rate of CO formation. This is a very rare case in which electrochemical promotion is found to promote a catalytic reaction and at the same time to poison a reaction proceeding in parallel with the promoted one. The faradic efficiency values were found to be on the order of 10–10³, which are among the highest reported in the EPOC hydrogenation literature. The kinetic and electropromotion results can be interpreted, using the rules of electrochemical promotion, in terms of the changes in the surface RuOx/Ru ratio induced via potential application, as observed via ex situ XPS.

P37. "Oscillatory behaviour of Rh/YSZ under electropromoted conditions", Chemical Physics Letters, 519-520 (2012) 89-92

Electrochemical induced oscillations were studied during ethylene oxidation over Rh films deposited on YSZ. Oscillations period and amplitude were for the first time analyzed depending on the applied potential or current, related with cyclic oxidation and reduction reactions and discussed on the basis of the phenomenon of the electrochemical promotion of catalysis.

P36. "Anodic oxidation of textile dyehouse effluents on boron-doped diamond electrode" Journal of Hazardous Materials 207-208 (2012) 91-96

The electrochemical oxidation of textile effluents over a boron-doped diamond anode was investigated in the present study. Experiments were conducted with a multi-component synthetic solution containing seventeen dyes and other auxiliary inorganics, as well as an actual effluent from a textile dyeing process. The effect of varying operating parameters, such as current density (4–50 mA/cm²), electrolyte concentration (0.1–0.5 M HClO₄), initial solution pH (1–12.3) and temperature (22–43°C), on process efficiency was investigated following changes in total organic carbon (TOC), chemical oxygen demand (COD) and color. Complete decolorization accompanied by significant mineralization (up to 85% depending on the conditions) could be achieved after 180

min of treatment. Performance was improved at higher electrolyte concentrations and lower pH values, while the effect of temperature was marginal. Energy consumption per unit mass of COD removed was favored at lower current densities, since energy was unnecessarily wasted to side reactions at higher densities.

P35. "BDD anodic oxidation as tertiary wastewater treatment for the removal of emerging micro-pollutants, pathogens and organic matter", Journal of Chemical Technology and Biotechnology 86 (2011) 1233-1236

*This work reports for the first time the removal of 17 α -ethynylestradiol (EE2), a synthetic estrogen hormone, from secondary treated effluents by electrochemical oxidation. Experiments were conducted in a single compartment reactor comprising a boron-doped diamond (BDD) anode and a zirconium cathode. EE2, in the range 100–800 $\mu\text{g L}^{-1}$, was spiked in the postchlorination effluent of a municipal treatment plant and oxidized at 0.9–2.6 mA cm^{-2} current density. Complete degradation of 100 $\mu\text{g L}^{-1}$ EE2 was achieved in 7 min at 2.1 mA cm^{-2} and inherent conditions, while the addition of 0.1 mol L^{-1} NaCl achieved removal in just a few seconds. The process was then tested in the pre-chlorination effluent at 2.1 mA cm^{-2} and inherent conditions; complete *E. coli* killing and EE2 removal occurred in just 1.5 and 3.5 min, respectively, while overall estrogenicity (assessed by the YES assay) and residual organic matter (in terms of chemical oxygen demand (COD)) decreased by 50% and 85% after 30min, respectively. These results clearly show the potential of BDD electrochemical oxidation to serve as an efficient tertiary wastewater treatment.*

P34. "Electrochemical oxidation of stabilised landfill leachate on DSA electrodes", Journal of Hazardous Materials, 190 (2011) 460

The electrochemical oxidation of stabilized landfill leachate with 2960 mgL^{-1} chemical oxygen demand (COD) over a Ti/IrO₂-RuO₂ anode was investigated in the presence of HClO₄ as the supporting electrolyte. Emphasis was given on the effect of electrolysis time (up to 240 min) and temperature (30, 60 and 80°C), current density (8, 16 and 32 mA cm^{-2}), initial effluent's pH (0.25, 3, 5 and 6), HClO₄ concentration (0.25 and 1M) and the addition of NaCl (20 and 100mM) or Na₂SO₄ (20mM) as source of extra electrogenerated oxidants on performance; the latter was evaluated regarding COD, total carbon (TC), total phenols (TPh) and color removal. Moreover, the anode was studied by scanning electron microscopy and cyclic voltammetry. The main parameters affecting the process were the effluent's pH and the addition of salts. Treatment for 240 min at 32 mA cm^{-2} current density, 80°C and the pH adjusted from its inherent value of 0.25 (i.e. after the addition of HClO₄) to 3 yielded 90% COD, 65% TC and complete color and TPh removal at an electricity consumption of 35 kWh kg^{-1} COD removed. Comparable performance (i.e. 75% COD reduction) could be achieved without pH adjustment but with the addition of 100mM NaCl consuming 20 kWh kg^{-1} COD removed.

P33. "Degradation of Reactive Red 120 using hydrogen peroxide in subcritical water", Desalination, 274 (2011) 200

Reactive azo dyes, such as Reactive Red 120, are commonly used to dye cellulosic fibres. Reactive dyes have a low utilization degree compared to other types of dyestuff, since the functional group also bonds to water, creating hydrolysis. This results in only 60% fixation to fabrics, therefore creating considerable amounts of wastewater. In this work, we propose a simplified method that uses hydrogen peroxide and manipulates the properties of the aqueous environment of the wastewater to degrade the dye. No pumping systems or rotational parts are required, just a closed vessel and a source of heat. Hydrogen peroxide is used as an environmentally-friendly oxidant, as it leaves no residues after treatment. Complete degradation of RR 120 was achieved at all temperatures, dye and oxidant concentrations in no more than 70 min. The TOC removal ranged between 20–64% at all conditions. This method is a safe and

environmentally-friendly process that has great potential for treating a wide range of textile wastewaters.

P32. "Electrochemical enhancement of solar photocatalysis: Degradation of endocrine disruptor bisphenol-A on Ti/TiO₂ films", *Water Research* 45 (2011) 2996

The photoelectrocatalytic oxidation over immobilized Ti/TiO₂ films in the presence of simulated solar light was investigated for the degradation of bisphenol-A (BPA) in water. The catalyst, consisting of 75:25 anatase:rutile, was prepared by a sol-gel method and characterized by cyclic voltammetry, X-ray diffraction and scanning electron microscopy. Experiments were conducted to assess the effect of applied current (0.02-0.32 mA/cm²), TiO₂ loading (1.3-9.2 mg), BPA concentration (120-820 mg/L), initial solution pH (1 and 7.5) and the aqueous matrix (pure water and treated effluent) on BPA photoelectrocatalytic degradation which was monitored by high performance liquid chromatography equipped with a fluorescence detector. The reaction was favored at anodic currents up to 0.04 mA/cm² and lower substrate concentrations, but it was hindered by the presence of residual organic matter and radical scavengers (e.g. bicarbonates) in treated effluents. Moreover, a pseudo-first order kinetic model could fit the experimental data well with the apparent reaction constant taking values between 2.9x10⁻³ and 32.4x10⁻³ min⁻¹. The degradation of BPA by pure photocatalysis or electrochemical oxidation alone was also studied leading to partial substrate removal. In all cases, the contribution of applied potential to photocatalytic degradation was synergistic with the photocatalytic efficiency increasing between 24% and 97% possibly due to a more efficient separation and utilization of the photogenerated charge carriers. The effect of photoelectrocatalysis on the ecotoxic and estrogenic properties of BPA was also evaluated measuring the bioluminescence inhibition of *Vibrio fischeri* and performing the yeast estrogen screening assay, respectively.

P31. "Solar light-induced degradation of bisphenol-A with TiO₂ immobilized on Ti", *Catalysis Today*, 161 (2011) 110

The photocatalytic degradation of bisphenol-A (BPA) was investigated over immobilized TiO₂/Ti-film catalysts irradiated by artificial solar light. Catalysts were prepared either by a sol-gel method (TIP catalyst) or deposition of Degussa P-25 slurry (P-25 catalyst) and characterized by X-ray diffraction. The effect of TiO₂ loading (0.65 and 1.3 mg), initial BPA concentration (150, 300 and 600 ppb) and initial solution pH (3, 6, 8 and 10) on degradation was studied. The latter was assessed following changes in BPA concentration by means of high performance liquid chromatography equipped with a fluorescence detector. It was found that both catalysts, consisting of about 75:25 anatase:rutile, were equally active in degrading BPA (e.g. 85% reduction at 300 ppb BPA concentration, 180 min of reaction, 0.65mg catalyst loading and inherent pH) and conversion increase with increasing the TiO₂ loading; however, the P-25 catalyst was considerably unstable at high loadings suffering about 50% active phase dissolution. Conversion decreased with increasing BPA concentration and it was favored in the pH range 6-8. BPA degradation can be approached by a pseudo-first order rate expression with the apparent kinetic constant taking values between 6x10⁻³ and 2x10⁻² s⁻¹.

P30. "Electrochemical oxidation of ammonia (NH₄⁺/NH₃) on thermally and electrochemically prepared IrO₂ electrodes", *Electrochimica Acta*, 56 (2011) 1361

The electrochemical oxidation of ammonia (NH₄⁺/NH₃) in sodium perchlorate was investigated on IrO₂ electrodes prepared by two techniques: the thermal decomposition of H₂IrCl₆ precursor and the anodic oxidation of metallic iridium. The electrochemical behaviour of Ir(IV)/Ir(III) surface redox couple differs between the electrodes indicating that on the anodic iridium oxide film (AIROF) both, the surface and the interior of the electrode are electrochemically active whereas on the thermally decomposed iridium oxide films (TDIROF), mainly the electrode surface participates in the electrochemical processes. On both electrodes, ammonia is oxidized in the potential region of

Ir(V)/Ir(IV) surface redox couple activity, thus, may involve Ir(V). During ammonia oxidation, TDIROF is deactivated, probably by adsorbed products of ammonia oxidation. To regenerate TDIROF, it is necessary to polarize the electrode in the hydrogen evolution region. On the contrary, AIROF seems not to be blocked during ammonia oxidation indicating its fast regeneration during the potential scan. The difference between both electrodes results from the difference in the activity of the iridium oxide surface redox couples.

P29. "Ammonia oxidation to nitrogen mediated by electrogenerated active chlorine on Ti/PtO_x-IrO₂" *Electrochemistry Communications* 12 (2010) 1203

The electrochemical oxidation of ammonia (NH₃ and/or NH₄⁺) in the presence of chloride was investigated on a Ti/PtO_x-IrO₂ electrode. It was shown that ammonia is effectively removed from solution via electrogenerated active chlorine. Based on mass balances, nitrogen is postulated to be the main product of ammonia electrolysis. In the bulk, the concentration of chloramines was low. This could be explained by the fact that the oxidation of ammonia takes place close to the electrode surface where an excess of chlorine relative to ammonia is ensured during the process. This results in the oxidation of ammonia to N₂ and in a local pH decrease. As a result, chloramines were decomposed in the proximity of the electrode prior to diffusing into the bulk.

P28. "Electrochemical promotion of methane oxidation on Rh/YSZ", *Applied Catalysis B: Environmental*, 101 (2010) 31

The effect of electrochemical promotion of catalysis (NEMCA effect or EPOC) has been studied for the methane oxidation reaction over Rh catalytic films interfaced with YSZ, an oxygen ion conductor, at temperatures from 350 to 550°C, under reducing, stoichiometric and oxidizing conditions. CO₂ is the main reaction product; however, CO is produced in small amounts at high temperatures. The effect of electrochemical promotion of catalysis on the reaction catalytic rate has been found to decrease by increasing partial pressure of oxygen and temperature. Under reducing conditions, at 430°C, positive current application can cause a 3-fold increase of the catalytic rate, while the apparent Faradaic efficiency is 170. After positive current interruption the catalytic rate reversibly returns to the initial open-circuit state value. Negative current application results in a 57% decrease of the catalytic rate with an apparent Faradaic efficiency equal to 40. After negative current interruption the catalytic rate slowly increases but remains lower than the initial value. This permanent poisoning effect has been interpreted by formation of a surface oxide layer by the strongly adsorbed oxygen from the gas phase upon negative polarization. A poisoning index, β, has been defined to quantify the magnitude of the effect. Moreover, under stoichiometric conditions, a periodical oscillation of the rate is observed both under open-circuit and polarization conditions in a narrow temperature window between 480 and 520°C, which is attributed to catalyst phase transition phenomena.

P27. "Anodic oxidation of phenol on Ti/IrO₂ electrode: Experimental studies", *Catalysis Today* 151 (2010) 185

The electrochemical oxidation of acidic solutions of phenol on a Ti/IrO₂ anode has been investigated by cyclic voltammetry and bulk electrolysis in a single-compartment cell. In the potential region of oxygen evolution, anodic oxidation resulted in electrode passivation (as evidenced by voltammetric measurements) allegedly due to the formation of a polymeric film on its surface. Phenol degradation increased with increasing temperature in the range investigated 30–80°C and it was affected by the addition of Cl⁻ and Br⁻ anions in the supporting electrolyte. Complete conversion of 10mM phenol was achieved after 37 Ah L⁻¹ of charge passed at 80°C under galvanostatic conditions (50mAcm⁻²) in absence of Cl⁻. In contrast only 10 Ah L⁻¹ were needed in the presence of 35mM Cl⁻. The presence of chloride can induce reactions involving chlorohydroxyl radicals and electrogenerated oxidants such as free chlorine. On the other hand, addition of Br⁻ slightly inhibited degradation possibly due to bromide scavenging of

electrogenerated active species. Phenol degradation proceeded through the formation of three dominant, aromatic intermediates, namely 1,4-benzoquinone, hydroquinone and pyrocatechol, while total oxidation to CO₂ was not significant unless harsh conditions (i.e. high temperatures and charges) were employed.

P26. "Electrochemical degradation of Reactive Red 120 using DSA and BDD anodes", Journal of Applied Electrochemistry 40 (2010) 1759

Electrochemical oxidation of an azo dye (Reactive Red 120) was studied in acidic media (1 M HClO₄) using DSA type (Ti/IrO₂-RuO₂) and boron doped diamond (BDD) anodes. Ti/IrO₂-RuO₂ exhibited low oxidation power with high selectivity to organic intermediates and low TOC removal (10% at 25°C and 40% at 80°C). On the other hand BDD was found to be suitable for total mineralization of the organic loading to CO₂. In both cases, the decoloration of the solution was almost 100% achieved very quickly with BDD (2 Ah L⁻¹) but only after long treatment with Ti/IrO₂-RuO₂ (25 Ah L⁻¹). The instantaneous current efficiency (ICE) was up to 0.13 in the case of Ti/IrO₂-RuO₂ and up to 0.45 in the case of BDD.

P25. "Electrochemical oxidation of benzoic acid in water over BDD electrodes: Statistical analysis of key operating parameters, kinetic modelling, reaction by-products and ecotoxicity", Chemical Engineering Journal 160 (2010) 538

The electrochemical oxidation of benzoic acid over boron-doped diamond electrodes was studied. Experiments were conducted in a flow-through electrolytic cell at current intensities ranging from 11 to 24 A, an electrolyte concentration of 0.05M and initial substrate concentrations ranging from 16 to 185mg L⁻¹. Liquid chromatography (LC) coupled to diode array detector was employed to follow benzoic acid concentration profiles, while chemical oxygen demand and dissolved organic carbon (DOC) analyses were carried out to assess the extent of mineralization. In preliminary experiments, the effect of different electrolytes (NaNO₃, NaCl or Na₂SO₄) and the initial pH of the solution (10 or 3.8) was evaluated. The effects of operating parameters such as applied current intensity, electrolysis time and initial benzoic acid concentration on the degradation and mineralization efficiency were investigated with the application of factorial design methodology and simple linear models describing and predicting adequately the removal of the substrate and DOC were developed. The initial substrate concentration and the treatment time constitute important parameters with regard to the efficiency of the process. Benzoic acid conversion proceeds through the hydroxylation of the aromatic ring as evidenced by the formation of several hydroxylated derivatives identified by LC coupled to mass spectroscopy (LC/MS-MS). Of these, monohydroxybenzoic acids appear to be quite stable to electrochemical oxidation. Toxicity tests with marine bacteria *V. fischeri* showed that, at the conditions in question, degradation by-products are consistently more toxic than the parent compound even after deep oxidation.

P24. "Recent developments and trends in Electrochemical Promotion of Catalysis", Journal of Applied Electrochemistry 40 (2010) 885

Electrochemical Promotion of Catalysis (EPOC or NEMCA effect) is one of the most exciting discoveries in Electrochemistry with great impact on many catalytic and electrocatalytic processes. According to John O'M. Bockris, EPOC is a triumph, and the latest in a series of advances in electrochemistry which have come about in the last 30 years. It has been shown with more than 80 different catalytic systems that the catalytic activity and selectivity of conductive catalysts deposited on solid electrolytes can be altered in a very pronounced, reversible and, to some extent, predictable manner by applying electrical currents or potentials (typically up to 2V) between the catalyst and a second electronic conductor (counter electrode) also deposited on the solid electrolyte. The induced steady-state change in catalytic rate can be up to 135x10³ % higher than the normal (open-circuit) catalytic rate and up to 3x10⁵ higher than the steady-state rate of ion supply. EPOC studies in the last 7 years mainly focus on the following four areas: Catalytic

reactions with environmental impact (such as reduction of NO_x and oxidation of light hydrocarbons), mechanistic studies on the origin of EPOC (using mainly oxygen ion conductors), scale-up of EPOC reactors for potential commercialization via development of novel compact monolithic reactors and application of EPOC in high or low temperature fuel cells via introduction of the concept of triode fuel cell. The most recent EPOC studies in these areas are discussed in the present review and some of the future trends and aims of EPOC research are presented.

P23. "Effectiveness factor of isopropanol oxidation on IrO₂ based electrodes of different loading" *Electrochimica Acta* 55 (2010) 8215

The influence of IrO₂ loading on the effectiveness factor, E_f , of the electrochemical oxidation of isopropanol was investigated. A model has been proposed based on three main reactions: Electrochemical IrO₂ oxidation to IrO₃, chemical oxidation of isopropanol via IrO₃ and O₂ evolution via decomposition of IrO₃. It has been found that the effectiveness factor, E_f , for the electrochemical oxidation of IrO₂ to IrO₃ is loading independent contrary to the chemical reaction which decreases with increasing IrO₂ loading.

P22. "DSA electrochemical treatment of olive mill wastewater on Ti/RuO₂ anode", *Journal of Applied Electrochemistry* 40 (2010) 729

The electrochemical oxidation of olive mill wastewater (OMW) over a Ti/RuO₂ anode was studied by means of cyclic voltammetry and bulk electrolysis and compared with previous results over a Ti/IrO₂ anode. Experiments were conducted at 300–1,220 mg L⁻¹ initial chemical oxygen demand (COD) concentrations, 0.05–1.35 V versus SHE and 1.39–1.48 V versus SHE potential windows, 15–50 mA cm⁻² current densities, 0–20 mM NaCl, Na₂SO₄, or FeCl₃ concentrations, 80°C temperature, and acidic conditions. Partial and total oxidation reactions occur with the overall rate being near first-order kinetics with respect to COD. Oxidation at 28 Ah L⁻¹ and 50 mA cm⁻² leads to quite high color and phenols removal (86 and 84%, respectively), elimination of ecotoxicity, and a satisfactory COD and total organic carbon reduction (52 and 38%, respectively). Similar performance can be achieved at the same charge (28 Ah L⁻¹) using lower current densities (15 mA cm⁻²) but in the presence of various salts. For example, COD removal is less than 7% at 28 Ah L⁻¹ in a salt-free sample, while addition of 20 mM NaCl results in 54% COD reduction. Decolorization of OMW using Ti/RuO₂ anode seems to be independent of the presence of salts in contrast with Ti/IrO₂ where addition of NaCl has a beneficial effect on decolorization.

P21. "Effectiveness factor of fast (Fe³⁺/Fe²⁺), moderate (Cl₂/Cl⁻) and slow (O₂/H₂O) redox couples using IrO₂ based electrodes of different loading", *Journal of Applied Electrochemistry* 39 (2009) 1827

The effectiveness factor, E_f , (fraction of the electrode surface which participates effectively in the investigated reaction) of fast (Fe³⁺/Fe²⁺), moderate (Cl₂/Cl⁻) and slow (O₂/H₂O) redox couples has been estimated using IrO₂ based electrodes with different loading. The method of choice was linear sweep voltammetry (measurement of the anodic peak current) for the Fe³⁺/Fe²⁺ redox couple and steady-state polarization (determination of the exchange current) for the O₂ and Cl₂ evolution reactions. The results have shown that the effectiveness factor depends strongly on the kinetics of the investigated redox reaction. For the Fe³⁺/Fe²⁺ redox couple effectiveness factors close to zero (max 4%) have been obtained contrary to the O₂ evolution reaction where effectiveness factors close to 100% can be achieved, all being independent of IrO₂ loading. For the Cl₂ evolution reaction intermediate values of the effectiveness factor have been found and they decrease strongly, from 100% down to about 60%, with increasing loading.

P20. "Boron-doped diamond anodic treatment of olive mill wastewaters: Statistical analysis, kinetic modeling and biodegradability", *Water Research* 43 (2009) 3999

The electrochemical treatment of olive mill wastewaters (OMW) over boron-doped diamond (BDD) electrodes was investigated. A factorial design methodology was implemented to evaluate the statistically important operating parameters, amongst initial COD load (1000–5000 mg/L), treatment time (1–4 h), current intensity (10–20 A), initial pH (4–6) and the use of 500 mg/L H₂O₂ as an additional oxidant, on treatment efficiency; the latter was assessed in terms of COD, phenols, aromatics and color removal. Of the five parameters tested, the first two had a considerable effect on COD removal. Hence, analysis was repeated at more intense conditions, i.e. initial COD values up to 10,000 mg/L and reaction times up to 7 h and a simple model was developed and validated to predict COD evolution profiles. The model suggests that the rate of COD degradation is zero order regarding its concentration and agrees well with an electrochemical model for the anodic oxidation of organics over BDD developed elsewhere. The treatability of the undiluted effluent (40,000 mg/L COD) was tested at 20 A for 15 h yielding 19% COD and 36% phenols' removal respectively with a specific energy consumption of 96 kWh/kg COD removed. Aerobic biodegradability and ecotoxicity assays were also performed to assess the respective effects of electrochemical treatment.

P19. "Electrochemical behaviour of ammonia (NH₄⁺/NH₃) on electrochemically grown anodic iridium oxide film (AIROF) electrode", *Electrochemistry Communications* 11 (2009) 1590

The electrochemical behaviour of ammonia (NH₄⁺/NH₃) in sodium perchlorate at pH 9 has been investigated on electrochemically grown anodic iridium oxide film (AIROF) electrode. In base electrolyte at pH 9, the Ir(IV)/Ir(III) surface redox couple exhibits unusually large separation of the oxidation/reduction peaks ($\Delta E_p \sim 750$ mV) due to the local pH changes within the oxide film. These local pH changes are induced by protons released/consumed during the Ir(IV)/Ir(III) redox activity. As a consequence, the local pH within AIROF changed up to 10 units during potential cycling. The presence of ammonia at pH 9 prevents these local pH changes because NH₄⁺/NH₃ buffer the solution inside the electrode. As a consequence, ΔE_p of Ir(IV)/Ir(III) was reduced to 100 mV. It has been shown further that ammonia oxidation is mediated by Ir(V), resulting in the appearance of anodic peaks in forward and backward scans.

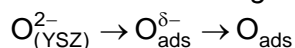
P18. "Electrochemical Oxidation of model compounds and Olive Mill Wastewater over DSA electrodes: 1. The case of Ti/IrO₂" *Journal of Hazardous Materials* 167 (2009) 268

The electrochemical oxidation of olive mill wastewater (OMW) over a Ti/IrO₂ anode has been studied by means of cyclic voltammetry and bulk electrolysis. Both model organic compounds typically found in OMW and actual effluent were tested. Bulk electrolysis experiments were conducted for *p*-coumaric, cinnamic, caffeic acid and phenol aqueous solutions. Besides, electrolysis of actual OMW was studied in the temperature range between 60 and 80 °C at various NaCl concentrations (0, 5, 15 and 25 mM). at 80 °C and $j = 50$ mA cm⁻², after 43 Ah dm⁻³ of charge passed, complete decolouration of OMW and total phenols removal up to 90 % was achieved, in the presence of 5mM NaCl. On the other hand in the absence of sodium chloride the observed value for total phenols removal under the same conditions was 65%. The COD removal was almost the same regardless of the amount of NaCl added while the maximum value of total phenols removal observed without any NaCl addition was 85% after 125 Ah dm⁻³ of charge passed. After this period of applied current COD was decreased around 85%.

P17. "Temperature programmed desorption of oxygen from Pd films interfaced with Y₂O₃-doped ZrO₂", *Journal of Applied Electrochemistry* 38 (2008) 1097

The origin of the effect of non-faradaic electrochemical modification of catalytic activity (NEMCA) or Electrochemical Promotion was investigated via temperature-programmed-desorption (TPD) of oxygen, from polycrystalline Pd films deposited on 8 mol%Y₂O₃-stabilized-ZrO₂ (YSZ), an O²⁻

conductor, under high-vacuum conditions and temperatures between 50 and 250 °C. Oxygen was adsorbed both via the gas phase and electrochemically, as O^{2-} , via electrical current application between the Pd catalyst film and a Au counter electrode. Gaseous oxygen adsorption gives two adsorbed atomic oxygen species desorbing at about 300 °C (state β_1) and 340–500 °C (state β_2). The creation of the low temperature peak is favored at high exposure times (exposure >1 kL) and low adsorption temperatures ($T_{ads} < 200$ °C). The decrease of the open circuit potential (or catalyst work function) during the adsorption at high exposure times, indicates the formation of subsurface oxygen species which desorbs at higher temperatures (above 450 °C). The desorption peak of this subsurface oxygen is not clear due to the wide peaks of the TPD spectra. The TPD spectra after electrochemical O^{2-} pumping to the Pd catalyst film show two peaks (at 350 and 430 °C) corresponding to spillover O_{ads} and $O^{\delta-}_{ads}$ according to the reaction:



The formation of the spillover $O^{\delta-}_{ads}$ oxygen species is an intermediate stage before the formation of the atomic adsorbed oxygen, O_{ads} . Mixed gaseous and electrochemical adsorption was carried out in order to simulate the Electrochemical Promotion conditions. The initial surface coverage with oxygen from the gas phase plays a very important role on the high or low effect of polarization. In general mixed adsorption leads to much higher oxygen coverages compare with that observed either under gaseous or electrochemical adsorption. The binding strength of the atomic adsorbed oxygen (state β_2) was investigated as a function of applied potential. It was found that the binding energy decreases linearly with increasing catalyst potential and work function. Similar behavior has been observed for oxygen adsorption on Pt, Ag and Au deposited on YSZ in previous studies.

P16. "Electrochemical promotion of catalysis (EPOC): Perspectives for application to gas emissions treatment", Global Nest Journal 10 (2008) 225

Heterogeneous Catalysis and Electrocatalysis can be used very effectively on air pollution control. Air emissions coming either from mobile sources or from stationary sources, including volatile organic emissions, nitrogen oxides, hydrocarbons and carbon monoxide could be well converted to harmless non-pollutants at reasonable temperatures with cost-effective systems utilizing heterogeneous catalysis and suitable catalysts. Some of the disadvantages of conventional heterogeneous catalysts are the high production cost (since most of them are metal supported catalysts), short life time (due to the catalyst deactivation) and the weakness to control their activity during the catalytic process. A new phenomenon of Solid State Electrochemistry called Electrochemical Promotion of Catalysis (EPOC) combined with classical heterogeneous catalysis could be applied in order to overcome some of the above problems. In this paper we are trying to show with characteristic examples how EPOC could be useful in environmentally important reactions (oxidations, reductions, etc). The results show that EPOC reveals great perspectives in environmental issues and especially in gas emissions treatment technology. The utilization of EPOC could be really useful since we can increase the catalytic activity, alter the selectivity to the desirable products and simultaneous control the reaction rate during a given electrocatalytic process.

P15. "First principles analytical prediction of the conductivity of Nafion membranes", Electrochimica Acta 52 (2007) 2244-2256

A first principles model is developed to describe and predict the protonic conductivity of fully hydrated Nafion membranes and its peculiar non-linear dependence on membrane thickness, potential and P_{H_2} . The model focuses on the surface migration of protons between adjacent sulfonate groups and utilizes the Poisson–Boltzmann charge distribution around each proton combined with the basic Gamow equation of quantum mechanics for proton tunneling. It is shown that the proton tunneling distance equals the proton wavelength and that each proton surrounded by its Debye–Hückel cloud behaves as a leaking nanobattery. The model, which contains no adjustable parameters, is solved analytically and its predictions are in semiquantitative agreement

with experiment, including the magnitude of the conductivity, its linear increase with membrane thickness, its exponential increase with potential and its strong dependence on P_{H_2} .

P14. "Monolithic Electrochemically Promoted Reactors: A step for the practical utilization of Electrochemical Promotion", Solid State Ionics 177 (2006) 2201

A novel dismantlable monolithic-type electrochemically promoted catalytic reactor and "smart" sensor-catalytic reactor unit has been constructed and tested for hydrocarbon oxidation and NO reduction by C_2H_4 in the presence of O_2 . In this novel reactor, thin (~40 nm) porous catalyst films made of two different materials are sputter-deposited on opposing surfaces of thin (0.25 mm) parallel solid electrolyte plates supported in the grooves of a ceramic monolithic holder and serve as sensor or electropromoted catalyst elements. The catalyst dispersion was higher than 10%. A 22 flat plate reactor operated with apparent Faradaic efficiency up to 100, at near complete reactants conversion, at gas flow rates up to 30 l/min. The novel design has only two external electrical connections and thus significantly facilitates the practical utilization of electrochemical promotion of catalysis.

P13. "Potential-dependent electrolyte resistance and steady-state multiplicities of PEM fuel cells" Solid State Ionics 177 (2006) 2397

The role of the non-linear conductivity of fully hydrated Nafion membranes is discussed on the performance of state-of-the-art PEM fuel cells. It is shown that the Nafion conductivity contains two components, one constant corresponding to proton transport in the aqueous phase of the membrane, the other exponentially dependent on potential, linearly increasing with membrane thickness and strongly increasing with hydrogen partial pressure at the anode. A simple macroscopic mathematical model, accounting for the observed exponential dependence of Nafion conductivity on potential is developed and shown to provide a semiquantitative fit to the experimental $I-U$ curves.

P12. "Proton and electron wave-particles in chemical and physical environments", Applied Catalysis B: Environmental 64 (2006) 111

The energy equations resulting from the dual particle-wave nature of protons, neutrons and/or electrons are used, in conjunction with the necessary relativistic corrections, to obtain an analytical expression for the gravitational constant, G , in terms of h , e , c , and the proton mass m_p . The analytically computed value of $G=6.676 \times 10^{-11} \text{ m}^3/(\text{kg s}^2)$ is in excellent (within 0.04%) agreement with experiment. The stability of nuclei, also of chemical molecules, is analyzed by the same approach and the energies of formation of the He nucleus (~27.1 MeV), and the H_2 molecule (~4.52 eV) are computed analytically with high accuracy, without any typical quantum mechanical treatment. The unification of strong interactions, gravitational and electrostatic forces is also demonstrated and discussed.

P11. "The effect of catalyst film thickness on the magnitude of the Electrochemical Promotion for the case of ethylene oxidation on Pt/YSZ", Topics in Catalysis 39 (2006) 97-100

The effect of catalyst film thickness on the magnitude of the effect of electrochemical promotion of catalysis (EPOC or NEMCA effect) was investigated for the model catalytic reaction of C_2H_4 oxidation on porous Pt paste catalyst-electrodes deposited on YSZ. It was found that the catalytic rate enhancement ρ is up to 400 for thinner (0.2 μm) Pt films (40,000% rate enhancement) and gradually decreases to 50 for thicker (1 μm) films. The results are in good qualitative agreement with model predictions describing the diffusion and reaction of the backspillover O^{2-} species which causes electrochemical promotion.

P10. "The effect of catalyst film thickness on the magnitude of the Electrochemical Promotion of catalytic reactions", Topics in Catalysis 38 (2006) 157

The effect of catalyst film thickness on the magnitude of the effect of electrochemical promotion was investigated for the model catalytic reaction of C₂H₄ oxidation on porous Pt paste catalyst-electrodes deposited on YSZ. It was found that the catalytic rate enhancement ρ is up to 400 for thinner (0.2 μ m) Pt films (40,000% rate enhancement) and gradually decreases to 50 for thicker (1 μ m) films. The Faradaic efficiency Λ was found to increase moderately with increasing film thickness and to be described semiquantitatively by the ratio $2Fr_0/I_0$, where r_0 is the unpromoted rate and I_0 is the exchange current of the catalyst–electrolyte interface. The results are in good qualitative agreement with model predictions describing the diffusion and reaction of the backspillover O²⁻ species, which causes electrochemical promotion.

P9. "The effect of membrane thickness on the conductivity of Nafion", Electrochimica Acta 51 (2006) 2743-2755

The conductivity of fully hydrated Nafion 112, 1135, 115 and 117 membranes was measured via ac impedance spectroscopy and steady-state current–potential measurements both in symmetric H₂, Pt|Nafion|Pt, H₂ and D₂, Pt|Nafion|Pt, D₂ PEM cells and in H₂, Pt|Nafion|Pt, air and D₂, Pt|Nafion|Pt, air PEM fuel cells. In agreement with recent studies, it was found that the conductivity, σ , increases almost linearly with membrane thickness L and also depends exponentially on potential and almost linearly on $P_{H_2}^{1/2}$. These and other observations, including the strong isotope effect obtained upon switching between H₂ and D₂ at the anode, show that the conductivity of Nafion contains two components, one due to proton migration in the aqueous phase, the other due to proton tunneling between adjacent sulfonate groups in narrow pores. The observed near-linear increase of σ with L is consistent with the proton tunneling mechanism but can also be explained by the existence of skin layers with lower conductivity at the ionomer interfaces with the anode and cathode.

P8. "The role of potential-dependent electrolyte resistance in the performance and steady-state multiplicities of PEM fuel cells: Experimental investigation and macroscopic modeling" Electrochimica Acta 50 (2005) 5132

The current–potential curves of polymer electrolyte membrane (PEM) fuel cells exhibit under certain conditions steady-state multiplicity, i.e. for a fixed current value, there are two corresponding cell potential values and thus the current versus potential curve exhibits a local maximum. This behaviour cannot be described by any of the known classical mathematical expressions for overpotential. We have studied this phenomenon in PEM fuel cells operating on H₂ with Pt cathodes and Pt-Ru- or C-based anodes and have found that the steady-state multiplicity results from the significant dependence of the Nafion membrane conductivity on cell potential. A simple mathematical model accounting for this non-linear behaviour of Nafion conductivity describes semiquantitatively the results both of the present work and of previous literature studies, where the current–potential curves exhibit either steady-state multiplicity or a significant downward bending of the current–potential curve. The role of the non-linear Nafion membrane conductivity in the current and potential oscillations observed in presence of CO at the anode is also briefly discussed together with its implications about the proton transfer mechanism in the Nafion membrane.

P7. "Electrochemical promotion of Catalysis: Mechanistic investigations and monolithic electropromoted reactors", Catalysis Today 100 (2005) 133

Recent progress is surveyed both in elucidating the mechanism of electrochemical promotion at the molecular level and in utilizing it in monolithic electropromoted catalytic reactors. On the mechanistic side, recent ¹⁸O₂ TPD and ¹⁸O₂ + CO TP reaction studies have confirmed, together

with STM, the validity of the sacrificial promoter model for both electrochemical promotion and metal-support interactions of Pt and Rh with anionic (YSZ) and mixed anionic-electronic supports. On the practical side, two recent advances are discussed, i.e., the electropromotion of thin (40 nm) sputtered catalyst films, with metal dispersion of the order of 20%, and the development of the monolithic electropromoted reactor (MEPR) which is a hybrid between a monolithic catalytic reactor and a flat-plate solid oxide fuel cell and allows for compact design and easy scale-up and scale-down of electropromoted catalytic units.

P6. "Proton tunneling-induced bistability, oscillations and enhanced performance of PEM fuel cells", Applied Catalysis B: Environmental 56 (2004) 237

Proton migration through hydrated Nafion membranes in polymer electrolyte membrane (PEM) fuel cells occurs both in the aqueous phase of the membrane and on the sulfonate groups on the surface of the membrane pores. Here we show using D_2 and H_2 fuel and basic quantum mechanical equations that this surface proton migration is largely due to proton tunneling between adjacent sulfonate groups, leading to an exponential variation of Nafion conductivity with cell potential. This amphibious mode of proton migration, particle-like in the aqueous phase and wave-like in the narrow pores, is shown to be the major cause of cell overpotential, bistability and oscillations of state-of-the-art PEM fuel cells operating on H_2 , reformat or methanol fuel. We also show that this phenomenon can be exploited via introduction of a third auxiliary electrode to independently control the anode-cathode potential difference and dramatically enhance fuel cell power output even in absence of noble metals at the anode.

P5. "Comparative isotope-aided investigation of Electrochemical Promotion and Metal-Support Interactions: 2. CO oxidation by $^{18}O_2$ on electropromoted Pt films deposited on YSZ and on nanodispersed Pt/YSZ catalysts", Journal of Catalysis 226 (2004) 197

The oxidation of CO by gaseous $^{18}O_2$ was investigated on electropromoted Pt films deposited on Y_2O_3 -stabilized ZrO_2 (YSZ) and on nanodispersed Pt/YSZ catalysts under high vacuum and under atmospheric pressure conditions. For both catalyst systems and in both cases it was found that the temperature dependence of the catalytic oxidation rate can be correlated directly with the corresponding TPD spectra of $^{18}O_2$, $^{16}O^{18}O$, and $^{16}O_2$ and that lattice oxygen plays a key role in the oxidation reaction, acting both as a reactant and as a sacrificial promoter. For both systems the results confirm the sacrificial promoter model of electrochemical promotion and metal-support interactions with O^{2-} -conducting supports. This mechanism contains as limiting cases the promoted Langmuir-Hinshelwood and the Mars-van Krevelen mechanisms, which predominate at low and high temperatures, respectively.

P4. "Novel monolithic electrochemically promoted catalytic reactor for environmentally important reactions", Applied Catalysis B: Environmental 52 (2004) 181

A novel dismantlable monolithic-type electrochemically promoted catalytic reactor and "smart" sensor-catalytic reactor unit has been constructed and tested for hydrocarbon oxidation and NO reduction by C_2H_4 in presence of O_2 . In this novel reactor, thin (~20–40 nm) porous catalyst films made of two different materials are sputter-deposited on opposing surfaces of thin (0.25 mm) parallel solid electrolyte plates supported in the grooves of a ceramic monolithic holder and serve as sensor or electropromoted catalyst elements. Using Rh/YSZ/Pt-type catalyst elements, the 22-plate reactor operated with apparent Faradaic efficiency exceeding 25 achieving near complete fuel and NO conversion at 300°C in presence of up to 1.1% O_2 in the feed at gas flow rates exceeding 1.3 l/min. The metal catalyst dispersion was of the order of at least 15%. The novel reactor design requires only two external electrical connections and permits easy practical utilization of the electrochemical promotion of catalysis.

P3. "Comparative isotope-aided investigation of Electrochemical Promotion and Metal-Support Interactions: 1. $^{18}\text{O}_2$ TPD of electropromoted Pt films deposited on YSZ and of dispersed Pt/YSZ catalysts", Journal of Catalysis 222 (2004) 192

The adsorption of $^{18}\text{O}_2$ on porous electropromoted Pt films deposited on Y_2O_3 -stabilized ZrO_2 (YSZ) and on nanodispersed Pt catalysts deposited on YSZ powder was investigated via TPD. The TPD spectra are very similar for both systems: When $^{18}\text{O}_2$ adsorption takes place above 200°C , two O adsorption states (β_2 and β_3 states) form, which desorb at 425 and 500°C , respectively. The latter is always occupied by lattice oxygen. For $^{18}\text{O}_2$ adsorption temperatures below 100°C a weakly bonded state (β_1 state) forms in addition to the β_2 and β_3 states. It desorbs at 100 – 160°C and is occupied exclusively by ^{18}O . Both the Pt film and the nanodispersed Pt catalyst act as oxygen portholes and mediate, via O spillover and backspillover, respectively, the incorporation of gaseous $^{18}\text{O}_2$ into the YSZ lattice during adsorption as well as the desorption of lattice ^{16}O during TPD. The excess oxygen stored in YSZ plays a key role in interpreting the TPD spectra. The observed very strong similarity between the O_2 TPD spectra of electrochemically promoted Pt/YSZ films and nanodispersed Pt/YSZ powder catalysts corroborates the mechanistic equivalence of electrochemical promotion and metal-support interactions (MSI) with O^{2-} -conducting supports.

P2. "Temperature Programmed Oxygen Desorption of the Perovskites Series $\text{Ln}_{0.65}\text{Sr}_{0.3}\text{Mn}_{0.8}\text{Co}_{0.2}\text{O}_3$ (Ln: La-Gd)", Ionics 7 (2001) 101

Temperature programmed O_2 desorption (hereafter denoted reduction, TPR) in a high vacuum system equipped with a mass spectrometer was used to investigate the oxygen loss as a function of temperature in perovskites materials of the type $\text{Ln}_{0.65}\text{Sr}_{0.3}\text{Mn}_{0.8}\text{Co}_{0.2}\text{O}_3$ (Ln = La-Gd), which are important as potential electrode materials for solid oxide fuel cells (SOFC). The materials were prepared either by spray drying as described elsewhere or via the Pechini method for the perovskites with Ln = Nd-Gd. The TPR experiments were carried out at temperatures 300 – 1000 K with various heating rates β in order to determine the onset of reduction and the activation energy of reduction for each perovskite. The experiments were carried out in an ultra high vacuum chamber (base pressure 10^{-10} mbar after baking) equipped with a quadrupole mass spectrometer. Additional oxygen adsorption was attempted at several adsorption temperatures but no discrete oxygen desorption peaks were observed before the onset of reduction. $\text{Pr}_{0.65}\text{Sr}_{0.3}\text{Mn}_{0.8}\text{Co}_{0.2}\text{O}_3$ was found to have the lowest reduction activation energy (149 ± 19 kJ/mol) and the lowest temperature, T_R , for onset of reduction (750 K). On the other hand $\text{Gd}_{0.65}\text{Sr}_{0.3}\text{Mn}_{0.8}\text{Co}_{0.2}\text{O}_3$ was found to have the highest reduction activation energy (232 ± 38 kJ/mol) while the T_R was about 850 K. The reduction activation energies follow the sequence $\text{Pr} < \text{Sm} < \text{Eu} < \text{La} < \text{Nd} < \text{Gd}$ while the T_R values follow the sequence $\text{Pr} < \text{La} < \text{Gd} < \text{Eu} < \text{Sm} < \text{Nd}$.

P1. "High-Pressure Electrochemical Promotion of Ammonia Synthesis over an Industrial Iron Catalyst", The Journal of Physical Chemistry A, 104 (1999) 10600-10602

The catalytic reaction of ammonia synthesis is of paramount importance in the chemical industry, mainly for fertilizers production. The reaction is equilibrium limited and is favored by low temperatures and high operating pressure. Since the pioneering work of Haber and Bosch the industrial ammonia synthesis is carried out over potassium-promoted Fe catalysts at pressures up to 300 bar. Here we show that the catalytic activity of state-of-the-art fully promoted industrial ammonia synthesis catalysts can be enhanced by up to 1300% by interfacing the catalyst with a proton conductor ($\text{CaIn}_{0.1}\text{Zr}_{0.9}\text{O}_{3-a}$) and electrochemically supplying protons to the catalyst surface. The rate increase is up to 6 times larger than the rate of proton supply to the catalyst. This is the first demonstration of the effect of electrochemical promotion, or non-Faradaic electrochemical modification of catalytic activity (NEMCA) using a commercial catalyst and under high (50 bar) pressure. It is also the first demonstration of scale-up of an electrochemically promoted catalytic reactor as 24 electrically connected catalyst pellets were used. The results could in principle lead to a substantial decrease in the operating temperature and pressure of ammonia synthesis reactors.