

# Plamen B. Atanasov, Ph.D.

Professor of Chemical & Nuclear Engineering and  
Associate Dean for Research - UNM School of Engineering

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## EDUCATION

1987 MS Chemical Physics & Theoretical Chemistry, University of Sofia, Department of Chemistry, Sofia, Bulgaria  
1988 Specialization in Bio-electrochemistry, Frumkin's Institute of Electrochemistry, Moscow, Russia  
1995 PhD Chemistry: Physical Chemistry, Bulgarian Academy of Sciences, Sofia, Bulgaria (Thesis Submitted 1992)

## EMPLOYMENT

Central Laboratory of Electrochemical Power Sources, Bulgarian Academy of Sciences, Sofia, Bulgaria

1987 - 1990 Staff Chemist  
1990 - 1991 Member of Technical Staff (Junior Research Fellow)  
1991 - 1992 Senior Member of Technical Staff (Research Fellow)

Department of Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, NM

1992 - 1993 Senior Research Associate  
1993 - 1999 Research Assistant Professor

Superior MicroPowders LLC, (now Cabot-SMP and Cabot-Fuel Cells) Albuquerque, NM

1999 - 2000 Research Scientist, Project Manager

Department of Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, NM

2000 - 2006 Assistant Professor  
2006 - 2009 Associate Professor  
2007 Visiting (sabbatical), Hawaii Natural Energy Institute, University of Hawaii, Manoa, Honolulu, HI  
2007 - 2011 Director of the UNM Center for Emerging Energy Technologies  
July 2009 - Professor of Chemical & Nuclear Engineering  
January 2012 - Associate Dean for Research, UNM School of Engineering

**MEMBERSHIP** American Chemical Society since 1996  
Electrochemical Society since 2000  
American Institute of Chemical Engineers since 2000  
American Society for Engineering Education since 2002  
International Society of Electrochemistry since 2010

**AWARDS** Fall 2000 and 2005 "Top Gobbler" Students' Appreciation Award ☺  
Spring 2003, UNM School of Engineering Junior Faculty Excellence in Research Award  
Spring 2004, UNM School of Engineering Junior Faculty Excellence in Teaching Award  
Spring 2004, 2005, 2006, 2010 and 2012 UNM/STC Inventors Award  
Spring 2005, NM Economic Development Department, "NM Technology All-Starr" Award  
Fall 2007 ACS Division of Fuel Chemistry Outstanding Service Award  
Spring 2008, UNM School of Engineering Senior Faculty Excellence in Research Award  
Fall 2008, UNM University Libraries Faculty Acknowledgement Award  
Fall 2010, Member-at-Large, Electrochemical Society, Physical & Analytical Electrochemistry  
Spring 2011, New Mexico Business Weekly "Who's Who in Technology" Award  
Summer 2012, Honorary Professor, Institute of Electrochemistry & Power Systems,  
Bulgarian Academy of Sciences

## RESEARCH INTERESTS

- Electrocatalysts for fuel cells: non-platinum electrocatalysts and nano-structured catalysts for PEMFC and AMFC;
- Bio-fuel cells based on enzyme-catalyzed electron transfer and biomimetic approaches in materials design;
- Engineering biosensors based on electrochemical detection of electron transfer: enzyme, DNA and immunosensors;
- Nano-structured materials derived through electrochemical processes: design of micro power sources and sensors.

## SYNERGISTIC ACTIVITIES

- *Electrochemical Society* and *American Chemical Society*: Member-at-Large, Physical & Analytical Electrochemistry Division (ECS); organizer of multiple, re-occurring symposia and initiatives.
- Chair of the *Gordon Research Conference* for Fuel Cells; established *Bishop's Lodge Workshops* in electrocatalysis and the first DOD-sponsored *Workshop on Biofuel Cells* (Washington, DC, 2002).
- Reviewer/panelist for national and international funding agencies: NSF, DOD and DOE; European Research Council (Large Programs Panel); funding agencies of Ireland, Israel, Canada and France.
- Editorial Service: member of the editorial board of *Electrocatalysis* (Springer) and *ChemElectroChem* (Wiley-VCH); guest editor to *Electroanalysis* (Wiley-VCH) and a co-editor of a book (Wiley) in press 2013.
- *Pajarito Powders Co.*: Advisory Board Member; start-up licensing UNM fuel cell technology; engaged in technology transfer and launching new non-platinum catalysts for fuel cells.

## COLLABORATORS

### *Collaborators & Co-editors (within last 48 months):*

Abhaya Datye, Tim Ward, Julia Fulghum, Dimiter Petsev, David Whitten and Jeff Brinker, *University of New Mexico*; Orlin Velev, *North Carolina State University*, Gabriel P. Lopez, *Duke*, Chris Cornelius, *U. Conn.*, Scott Calabrese Barton, *Michigan State University*, Shelley Minter, *University of Utah*, Scott Banta, *Columbia University*, David Baker, *University of Washington*, Sanjeev Mukerjee, *Northeastern University*, Bor Yann Liaw and Michael Cooney, *University of Hawaii*, Andy Herring, *Colorado School of Mines*, Corey Leclerc and Mike Riley, *New Mexico Tech*, Heinz Nakotte, Igor Sevostianov and Boris Kiefer, *New Mexico State University*, Juchao Yan, *Eastern New Mexico University*, Cy Fujimoto, Mike Hibbs, Suzan Brozik, Hongyou Fan, Chris Ablett, *Sandia NL*, Piotr Zelenay and Rod Borup, *Los Alamos NL*; Heather Luckarift and Glenn Johnson, *AFRL Tyndall AFB*; Berislav Blizanac and Paolina, Atanassova, *Cabot-SMP, Albuquerque, NM*, Sammer Singhal, *CFDRC, Huntsville, AL*.

## STUDENTS and TRAINEES

**Graduate Advisors & Postdoctoral Sponsors:** Ilia Iliev, *Central Laboratory of Electrochemical Power Sources, Sofia, Bulgaria*, Dissertation Advisor (deceased) and Ebtisam Wilkins, *Univ. of New Mexico*, Post-doctoral Advisor (retired).

**Thesis Advisor & Postgraduate-Scholar Sponsor:** Rhett Zyla (CNM), Sanjoy Mukherjee, (Fritto) Adam Rowen (SNL), Stephen Levendosky (DOE), Brian Key (LANL), Frisia Colon (Exxon-Mobile), Zhen Yuan (Symyx), Dayle Kerr (SNL), David Wood (ORNL); Madhu Dowlapalli (Celera), Tim Olson (NREL), Elise Switzer (ASU), Oana Marina (LANL), Elmer Garcia (LANL), Brandon Gutierrez (SNL), Dayle Kerr (SNL), Benito Martinez (Intel), Allen Schultz (Cabot), Loretta Trujillo (NMEL), Jennifer Corona (SNL), Sarah Dufay (Cabot), Elena Berliba-Vera (Intel), Gautam Gupta (LANL), Dough Reed (SNL), Daniel Konopka (Caltech), Raid Haddad (SNL), Rosalba Rincon (Rurhr Univ.), Kyle Fenton (SNL), Ron Goeke (SNL), Shayna Brocato (mom), Bayo Falase (Intel), Jared Roy (NRL), Michael Robson (Raytheon), Anant Patel (3M), Ulises Martinez (UNM);

**Current:** Claudia Narvaez, Cameron Harrison, Aaron Roy, Santiago Carbonell, Rachel Hjelm, Tieshia Francis, Nalin Anderson, Ryan Lopez, Michael Workman, Sarah Stariha, Sadia Kabir, Erika Cooley, Jonathan Coleman, Jamin Pillras (Total of **49** graduated from the group).

**Post-Docs/Res Faculty:** Juchao Yan (ENMU), Vijay Rajendran (UH), Marcos Barella (Intel), Claudia Luhrs (NPGU), Dmitri Brevnov (Applied Materials), Ravil Sitdikov (NanoMR), Svitlana Pylypenko (CSM), Carolin Lau (Roche), Dmitri Ivnitcki (Miami), Wendy Paterson (Regensburg), Barr Halevi (Pajarito Powder Co.),

**Current:** Kateryna Artyushkova, Alexey Serov and Sofia Babanova (Total of **14** being associated with the group).

**JOURNAL PUBLICATIONS: 200 peer-reviewed papers published, including 10 reviews, more than 5,500 citations, forming an H-index of 36**

**2013 – published in paper or electronically**

- A. Serov, M.H. Robson, M. Smolnik, **P. Atanassov**, Tri-metallic Transition Metal-Nitrogen-Carbon Catalysts Derived by Templated Sacrificial Support Method Synthesis, *Electrochimica Acta*, accepted (2013)
- J. Roy, S. Babanova, K. Garcia, J. Cornejo, L.K. Ista and **P. Atanassov**, Catalytic Biofilm Formation by *Shewanella oneidensis* MR-1 and Anode Characterization by Expanded Uncertainty, *Electrochimica Acta*, accepted (2013), invited paper
- G. Gupta, S. Iyer, K. Leasure, N. Virdone, A.M. Dattelbaum, **P. Atanassov** and G.P. Lopez, Stable and Fluid Multilayer Phospholipid-Silica Thin Films: Mimicking Active Multi-lamellar Biological Assemblies, *ACS Nano*, (2013) DOI: 10.1021/nm401123p
- A. Serov, U. Martinez and **P. Atanassov**, Novel Pd-In Catalysts for Alcohols Electrooxidation in Alkaline Media, *Electrochem. Comm.*, 34 (2013) 185–188
- S. Babanova, K. Artyushkova, Y. Ulyanova, S. Singhal and **P. Atanassov**, Design of Experiments and Principal Component Analysis as Approaches for Enhancing Performance of Gas-Diffusional Air-Breathing Bilirubin Oxidase Cathode, *J Power Sources*, (2013) DOI: 10.1016/j.jpowsour.2013.06.031
- H. Oh, T. Gennett, **P. Atanassov**, M. Kurttepli, S. Bals, K. E. Hurst, M. Hirscher, Hydrogen Adsorption Properties of Platinum Decorated Hierarchically Structured Templated Carbons, *Microporous & Mesoporous Materials*, 177 (2013) 66-74
- T. Sakamoto, K. Asazawa, U. Martinez, B. Halevi, T. Suzuki, S. Arai, D. Matsumura, Y. Nishihata, **P. Atanassov** and H. Tanaka, Electrooxidation of Hydrazine Hydrate Using Ni-La Catalyst for Anion Exchange Membrane Fuel Cells, *J Power Sources*, 234 (2013) 252-259
- J. Roy, H.R. Luckarift, S. Sizemore, K. Farrington, C. Lau, G. R. Johnson, and **P. Atanassov**, Microbial-Enzymatic-Hybrid Biological fuel Cell with Optimized Growth Conditions for *Shewanella oneidensis* DSP-10, *Enzyme & Microbial Technology*, 53 (2013) 123-127
- K. Artyushkova and **P. Atanassov**, X-ray Photoelectron Spectroscopy of Bio-nanocomposites: Challenges and Successes, *ChemPhysChem*, invited mini-review, (2013) DOI: 10.1002/cphc.201300037
- M. Falk, C.W. Narváez Villarrubia, S. Babanova, **P. Atanassov** and S. Shleev, Biofuel Cells for Biomedical Applications: Colonizing the Animal Kingdom, *ChemPhysChem*, (2013) DOI: 10.1002/cphc.201300044
- N.J. Carroll, P.F. Crowder, S. Pylypenko, W. Patterson, D.R. Ratnaweera, D. Perahia, **P. Atanassov** and D.N. Petsev, Microfluidic Synthesis of Monodisperse Nanoporous Oxide Particles and Control of Hierarchical Pore Structure, *ACS Applied Materials and Interfaces*, 5 (2013) 3524–3529
- K. Artyushkova, B. Kiefer, B. Halevi, A. Knop-Gericke, R. Schlogl and **P. Atanassov**, Density Functional Theory Calculations of XPS Binding Energy Shift for Nitrogen-containing Compounds, *Chem. Comm.*, 49 (2013) 2539 – 2541
- G.M. Strack, S. Babanova, K.E. Farrington, H.R. Luckarift, **P. Atanassov**, G.R. Johnson, PQQ-dependent glucose dehydrogenase as an anodic electrocatalyst: mediatorless redox processes for fuel cell applications, *Journal of the Electrochemical Society*, (2013) DOI: 10.1149/2.028307jes
- G.M. Strack, H.R. Luckarift, S.R. Sizemore, R.K. Nichols, K.E. Farrington, P. Wu, P. Atanassov, J. Biffinger and G.R. Johnson, Power Generation from a Hybrid Biological Fuel Cell in Seawater, *Bioresource Technology*, 128 (2013) 222–228
- K. Artyushkova, D. Habel-Rodriguez, T.S. Olson and **P. Atanassov**, Optimization of Ink Composition Based on Non-platinum Cathode for Single Membrane Electrode Assembly Proton Exchange Membrane Fuel Cells, *J Power Sources*, 226 (2013) 112-121
- S. Brocato, A. Serov and **P. Atanassov**, pH Dependence of Catalytic Activity for ORR of Non-PGM Catalysts, *Electrochimica Acta*, 87 (2013) 361-365
- S. Kattel, **P. Atanassov** and B. Kiefer, Catalytic Activity of Co-N<sub>x</sub>/C Electrocatalyst for Oxygen Reduction Reaction: a Density Functional Theory Study, *Phys. Chem. Chem. Phys.*, 15 (2013) 148 - 153
- S. Kattel, **P. Atanassov** and B. Kiefer, Density-Functional-Theory Prediction of Ni-N<sub>x</sub> Electrocatalyst Reactivity in Oxygen Reduction, in Alkaline and Acidic Media, *J. Phys. Chem.*, (2013) DOI: 10.1021/jp3044708
- M.H. Robson, A. Serov, K. Artyushkova and **P. Atanassov**, A Mechanistic Study of 4-Aminoantipyrine and Iron Derived Non-Platinum Group Metal Catalyst on the Oxygen Reduction Reaction, *Electrochimica Acta*, 90 (2013) 656–665

T.V. Reshetyenko, J. St-Pierre, K. Bethune, K. Artyushkova, R. Rocheleau and **P. Atanassov**, Multianalytical Study of Gas-diffusion Layer PTFE Content Local Variation, *ECS Transactions*, 50 (2013) 591-599

## 2012

S. Pylypenko, E. Peterson, B. Halevi, E. Champagne, T.S. Olson and **P. Atanassov**, Hierarchically-structured Pt-Alloy Ethanol Oxidation Electrocatalysts, *Electrocatalysis*, 3 (2012) 334-345

S. Kattel, **P. Atanassov** and B. Kiefer, Stability, Electronic and Magnetic Properties of In-Plane Defects in Graphene: A First-Principles Study, *J. Phys. Chem., C*, 116 (2012) 8161-8166

E. Baranova, M. Padilla, B. Halevi, T. Amir, K. Artyushkova and **P. Atanassov**, Electrooxidation of Ethanol on PdSn Nanoparticles in Alkaline Solutions: Correlation Structure and Catalytic Properties, *Electrochimica Acta*, 80 (2012) 377-382

A. Serov, M.H. Robson, K. Artyushkova and **P. Atanassov**, Templated Non-PGM Cathode Catalysts Derived from Iron and Poly(ethyleneimine) Precursors, *Applied Catalysis B: Environmental*, 127 (2012) 300-306

A. Serov, M.H. Robson, M. Smolnik and **P. Atanassov**, Templated Bi-Metallic Non-PGM Catalysts for Oxygen Reduction, *Electrochimica Acta*, 80 (2012) 213-218

G.P.M.K. Ciniciato, C. Lau, A. Cochrane, S.S. Sibbett, E.R. Gonzalez and **P. Atanassov**, Development of Paper-based Electrodes: from Air-breathing to Printable Enzymatic Cathodes, *Electrochimica Acta*, 82 (2012) 208-213

A. Serov, U. Martinez, B. Halevi, A. Falase and **P. Atanassov**, Highly Active Pd-Cu Catalysts for Electrooxidation of 2-Propanol, *Electrochem. Comm.*, 22 (2012) 193-196

A. Serov, M.H. Robson, B. Halevi, K. Artyushkova and **P. Atanassov**, Highly Active and Durable Templated Non-PGM Cathode Catalysts Derived from Iron and Aminoantipyrine, *Electrochem. Comm.*, 22 (2012) 53-56

A. Falase, K. Garcia, C. Lau, and **P. Atanassov**, Hybrid Nano-structured Platinum-based Catalyst/Enzyme Anode for Oxidation of Ethanol and Ethylene Glycol, *ECS Electrochem. Letters*, 1 (2012) F9-F11

V. Di Noto, E. Negro, S. Polizzi, P. Riello and **P. Atanassov**, Preparation, Characterization and Single-cell Performance of a New Class of Pd-Carbon Nitride Electrocatalysts for Oxygen Reduction Reaction in PEMFCs, *Applied Catalysis B: Environmental*, 111-112 (2012) 185-199

S.F. Maloy, G.L. Martin, **P. Atanassov** and M.J. Cooney, Controlled Deposition of Structured Polymer Films: Chemical and Rheological Factors in Chitosan Film Formation, *Langmuir*, 28 (2012) 2589-2595

J. Roy, C. Lau, A. Falase, P. Chellamuthu, H.R. Luckarift, R. Ramasamy, R. Gadhamshetty, G. Wanger, Y.A. Gorby, K.H. Neelson, O. Bretschger, G. R. Johnson, and **P. Atanassov**, A Study of Flavine Redox Reactions Catalyzed by *Shewanella oneidensis* MR-1 Cultures, *RSC Advances*, 2 (2012) 10020-10027

H.R. Luckarift, S. Sizemore, K. Farrington, J. Roy, C. Lau, **P. Atanassov** and G.R. Johnson, Facile Fabrication of Scalable, Hierarchically Structured Polymer/Carbon Architectures for Microbial Fuel Cell Electrodes, *ACS Applied Materials and Interfaces*, 4 (2012) 2082-2087

H.R. Luckarift, D.M. Ivnitksi, C. Lau, C. Khripin, **P. Atanassov** and G. R. Johnson, Gold-decorated Carbon Composite Electrodes for Enzymatic Oxygen Reduction, *Electroanalysis*, 24 (2012) 931-937

K. Artyushkova, S. Pylypenko, M. Dowlapalli and **P. Atanassov**, Structure-to-Property Relationships in Fuel Cells Catalysts Supports: Correlation of Surface Chemistry and Morphology with Oxidation Resistance of Carbon Blacks, *J. Power Sources*, 214 (2012) 303-313

K. Artyushkova, S. Pylypenko, M. Dowlapalli and **P. Atanassov**, Use of Digital Image Processing of Microscopic Images and Multivariate Analysis for Quantitative Correlation of Morphology, Activity and Durability of Electrocatalysts, *RSC Advances*, 2 (2012) 4304-4310

A. Patel, K. Artyushkova, **P. Atanassov**, V. Colbow, M. Dutta, D. Harvey, and S. Wessel, Investigating the Effects of PEMFC Conditions on Carbon Supported Platinum Electrocatalyst Composition and Performance, *J. Vacuum Sci. Tech. A*, 30 (2012) 04D107

S.D. Minter, **P. Atanassov**, H. Luckarift and G.R. Johnson, Interesting New Materials for Biological Fuel Cells, *Materials Today*, 15 (2012) 166-173

U. Martinez, K. Asazawa, B. Halevi, T. Olson, B. Kiefer, A. Datye, H. Tanaka, and **P. Atanassov**, Bimetallic NiZn Alloys for the Electrooxidation of Hydrazine in Alkaline Media, *Physical Chemistry and Chemical Physics*, 14 (2012) 5512-5517

A. Falase, M. Main, K. Garcia, A. Serov, C. Lau, and **P. Atanassov**, Electrooxidation of Ethylene Glycol and Glycerol by Pt-Based Binary and Ternary Templated Catalysts in Alkaline Media, *Electrochimica Acta*, 66 (2012) 295-301

S. Brocato, C. Lau and **P. Atanassov**, Mechanistic Study of Direct Electron Transfer in Bilirubin Oxidase, *Electrochimica Acta*, 61 (2012) 44-49

N.S. Parimi, Y. Umasankar, **P. Atanassov** and R.P. Ramasamy, Electrochemical Kinetic and Mechanistic Parameters of Laccase-Catalyzed Oxygen Reduction Reaction, *ACS Catalysis*, 2 (2012) 38-44

S. Tuurala, C. Lau, **P. Atanassov**, M. Smolander, and S. D. Minter Characterization and Stability Study of Immobilized PPQ-dependent Aldose Dehydrogenase Bioanode, *Electroanalysis*, 24 (2012) 229-238

C. Lau, E.R. Adkins, R.P. Ramasamy, H.R. Luckarift, G.R. Johnson and **P. Atanassov**, Design of Carbon-Nanotube-Based Gas Diffusion Cathode for O<sub>2</sub> Reduction by Multicopper Oxidase, *Advanced Energy Materials*, 2 (2012) 162-168

## 2011

T. Holland, C. Lau, S. Brozik, **P. Atanassov** and S. Banta, Protein Engineering of Glucose Oxidase for Direct Electron Transfer via Targeted Gold Nanoparticle Conjugation, *Journal of the American Chemical Society*, 133 (2011) 19262-19265

S.R. Higgins, C. Lau, **P. Atanassov**, S.D. Minter and M.J. Cooney, Hybrid Biofuel Cell: Microbial Fuel Cell with an Enzymatic Air-Breathing Cathode, *ACS Catalysis*, 1 (2011) 994-997

S.R. Higgins, C. Lau, **P. Atanassov**, S.D. Minter and M.J. Cooney, Standardized Characterization of a Flow Through Microbial Fuel Cell, *Electroanalysis*, 23 (2011) 2174-2181

S.R. Higgins, D. Foerster, A. Cheung, C. Lau, O. Bretschger, S.D. Minter, K. Nealon, **P. Atanassov** and M.J. Cooney, Fabrication of Macroporous Chitosan Scaffolds Doped with Carbon Nanotubes and their Characterization in Microbial Fuel Cell Operation, *Enzyme and Microbial Technology*, 48 (2011) 458-465

C.E. Ashley, D.R. Dunphy, J. Zhang, E.C. Carnes, Z. Yuan, D.N. Petsev, **P. Atanassov**, O.D. Velev, M. Sprung, J. Wang, D.S. Peabody and C. J. Brinker, Convective Assembly of 2D Lattices of Virus-Like Particles Visualized by In-situ Grazing Incidence Small-Angle Scattering, *Small*, 7 (2011) 1043-1050

G. Hong, D.M. Ivnitski, G.R. Johnson, **P. Atanassov** and R. Pachter, Design Parameters for Tuning the Type 1 Cu Multi-copper Oxidase Redox Potential: Insight from a Combination of First Principles and Empirical Molecular Dynamics Simulations, *Journal of the American Chemical Society*, 133 (2011) 4802-4809

G. R. Szilvay, S. Brocato, D. Ivnitski, C. Li, P. DeLa Iglesia, C. Lau, E. Chi, M. Werner-Washburne, S. Banta, and **P. Atanassov**, Engineering of a Redox Protein for DNA-Directed Assembly, *Chem. Comm.*, 47 (2011), 7464 - 7466

C. Narváez Villarrubia, R. Rincón, V. Radhakrishnan, V. Davis, and **P. Atanassov**, Methylene Green Electrodeposited on SWNTs-Based "Bucky" Papers for NADH and L-Malate Oxidation, *ACS Applied Materials and Interfaces*, 3 (2011) 2402-2409

R.A. Rincón, C. Lau, H.R. Luckarift, K.E. Garcia E. Adkins, G.R. Johnson and **P. Atanassov**, Membrane-less Enzymatic Flow-through Biofuel Cell, *Biosensors & Bioelectronics*, 27 (2011) 132-136

R.A. Rincón, C. Lau, K.E. Garcia and **P. Atanassov**, Flow-through 3D biofuel cell anode for NAD<sup>+</sup>-dependent enzymes, *Electrochimica Acta*, 56 (2011) 2503-2509

G. Gupta and **P. Atanassov**, Electrochemical DNA hybridization assay: enzyme-labeled detection of mutation in p53 gene, *Electroanalysis*, 23 (2011) 1615-1622

G. Gupta, C. Lau, B. Branch, V. Rajendran, D. Ivnitski and **P. Atanassov**, Direct Bio-electrocatalysis by Multi-copper Oxidases: Gas-diffusion Laccase-catalyzed Cathodes for Biofuel Cells, *Electrochimica Acta*, 56 (2011) 10767-10771

G. Gupta, C. Lau, V. Rajendran, F. Colon, B. Branch, D. Ivnitski and **P. Atanassov**, Direct Electron Transfer Catalyzed by Bilirubin Oxidase for Air-Breathing Gas-Diffusion Electrodes, *Electrochemistry Communications*, 13 (2011) 247-249

V. Gorshkov, O. Zavalov, **P. Atanassov** and V. Privman, Morphology of Nanoclusters and Nanopillars Formed in Non-equilibrium Surface Growth for Catalysis Applications, *Langmuir*, 27 (2011) 8554-8561- **cover-art featured article**

D. Konopka, B. Kiefer, Y. Jiang, T. Ward and **P. Atanassov**, Electrochemical Studies and DFT Analysis of Pt Stability and Surface Passivation on NbRu<sub>3</sub>O<sub>2</sub> Support, *Journal of Electrochemical Society*, 158 (2011) B804-B813



D.A. Konopka, M. Li, K. Artyushkova, N. Marinkovic, K. Sasaki, R. Adzic, T.L. Ward and **P. Atanassov**, Platinum Supported on  $\text{NbRu}_y\text{O}_z$  as Electrocatalyst for Ethanol Oxidation in Acid and Alkaline Fuel Cells, *Journal of Physical Chemistry C*, 114 (2011) 3043-3056

B.B. Blizanac, S. Pylypenko, T.S. Olson, D. Konopka and **P. Atanassov**, Functional DMFC Cathode Catalysts and Supports Based on Niobium Oxide Phase, *Journal of the Electrochemical Society*, 158 (2011) B485-B491

A. Falase, K. Garcia, C. Lau, and **P. Atanassov**, Electrochemical and *in Situ* IR Characterization of PtRu Catalysts for Complete Oxidation of Ethylene Glycol and Glycerol, *Electrochemistry Communications*, 13 (2011) 1488–1491

A. Falase, K. Garcia, M. Main, C. Lau, and **P. Atanassov**, Electrooxidation of Ethylene Glycol and Glycerol by Platinum Based Binary and Ternary Catalysts in Alkaline media, *Electrochemical Society Transactions*, 41 (2011) 1681-1685

E. Baranova, K. Artyushkova, B. Halevi, T. Amir, U. Martinez and **P. Atanassov**, Pt7Sn3 Catalysts for Ethanol Electro-Oxidation: Correlation Between Surface Structure and Catalytic Activity, *Electrochemical Society Transactions*, 41 (2011) 1691-1700

A. Patel, K. Artyushkova, **P. Atanassov**, D. Harvey, M. Dutta, V. Colbow and S. Wessel, Effect of Graphitic Content on Carbon Supported Catalyst Performance, *Electrochemical Society Transactions*, 41 (2011) 845-849

J.D. Fairweather, D. Spornjak, R. Mukundan, J. Spendelow, K. Artyushkova, **P. Atanassov**, D.S. Hussey, D.L. Jacobson and R. Borup, Interaction of Heat Generation, MPL, and Water Retention in Corroded PEMFCs, *Electrochemical Society Transactions*, 41 (2011) 337-348

## 2010

R.L. Arechederra, K. Artyushkova, **P. Atanassov** and S.D. Minteer, Growth of Phthalocyanine Doped and Undoped Nanotubes Using Mild Synthesis Conditions For Development of Novel Oxygen Reduction Catalysts, *ACS Applied Materials and Interfaces*, 2 (2010) 3295-3302

T.S. Olson, S. Pylypenko, S. Kattel, **P. Atanassov** and B. Kiefer, Selectivity of Cobalt-Based Non-Platinum Oxygen Reduction Catalysts in the Presence of Methanol and Formic Acid, *J. Phys. Chem. C.*, 114 (2010) 15190-15195

B. Piel, P. Zelenay, S. Levendosky, T. Olson and **P. Atanassov**, Highly Methanol-Tolerant Non-Precious Metal Cathode Catalysts for Direct Methanol Fuel Cell, *Electrochimica Acta*, 55 (2010), 7615-7621

D.M. Ivnitski, C. Khripin, H.R. Luckarift, G.R. Johnson and **P. Atanassov**, Surface Characterization and Direct Bioelectrocatalysis of Multicopper Oxidases, *Electrochimica Acta*, 55 (2010) 7385–7393

M.N. Arechederra, C. Jenkins, R. A. Rincón, K. Artyushkova, **P. Atanassov** and S.D. Minteer, Chemical Polymerization and Electrochemical Characterization of Thiazines for NADH Electrocatalysis Applications, *Electrochimica Acta*, 55 (2010) 6659-6664

R.R. Ramasamy, H.R. Luckarift, D.M. Ivnitski, **P. Atanassov** and G.R. Johnson, High Electrocatalytic Activity of Tethered Multicopper Oxidase-Carbon Nanotube Conjugates, *Chem. Comm.*, 46 (2010) 6045-6047 – **cover-art featured article**

H.R. Luckarift, S.R. Sizemore, J. Roy, C. Lau, G. Gupta, **P. Atanassov** and G.R. Johnson, Standardized Microbial Fuel Cell Anodes of Silica-Immobilized *Shewanella oneidensis*, *Chem. Comm.*, 46 (2010) 6048-6050

E. Katz and **P. Atanassov**, Biofuel Cells, *Electroanalysis* (Guest Editors for the Special Issue on Biofuel Cells), 22 (2010) 782-783

H.R. Luckarift D. Ivnitski, R.A. Rincón, **P. Atanassov** and G.R. Johnson Glucose Oxidase Catalyzed Self-Assembly of Bio-electroactive Gold Nanostructures, *Electroanalysis* (Special Issue on Biofuel Cells), 22 (2010) 784-792

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*Enzymatic Fuel Cells: From Fundamentals to Applications*

Edited by Heather R. Luckarift, Glenn R. Johnson & Plamen (under contract, planned for 2012) and co-authored 7 chapters

- 1.1. Enzymatic fuel cells: from fundamentals to applications, H. Luckarift, G. Johnson and **P. Atanassov**
- 2.1. The power of potential, **P. Atanassov**
- 2.2. Cathodic bioelectrocatalysis: oxygen reduction for biological fuel cells, D. Ivnitski, H. Luckarift and **P. Atanassov**
- 2.3. Anodic catalysts for oxidation of carbon-containing fuels, R. Rincon, C. Lau and **P. Atanassov**
- 3.7. Fundamental investigations on the structure and function of enzyme catalysts in the context of an electrochemical interface, S. Mukerjee, T.A. Arruda, J. Ziegelbauer, K. Artyushkova and **P. Atanassov**
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A. Serov, **P. Atanassov**

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**Non-exclusive Option to Pajarito Powder Co.**

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A. Serov, **P. Atanassov**

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A. Serov, U. Martinez, **P. Atanassov**  
Promotion Effect of Oxides in Oxidation of Fuels for Fuel Cell Applications  
*Provisional Application* 61/608,718 filed on March 9, 2012 PCT/US13/30151 (UNM 2012-083)

**P. Atanassov**, A. Serov  
Non-PGM Catalysts for Fuel Cell Application with Multimodal Pore Size Distribution  
*Provisional Application* 61/606,109 filed on March 2, 2012 (UNM 2012-076)

M. H. Robson, **P. Atanassov**, B. Halevi, A. Serov  
Sacrificial Support Intercalated Mixed Metal Oxygen Reduction Catalysts And Graphitic Carbon Sheets  
*Provisional Application* 61/606,082 filed on March 2, 2012 (UNM 2012-075)

H. Tanaka, **P. Atanassov**, K. Asazawa, A. Serov  
Non-PGM Cathode Catalysts for Fuel Cell Application Derived From M-Aminoantipyrine-Phenatrolone Materials (Where M=Transition Metal)  
*Provisional Application* 61/658,240 filed on June 11, 2012 (UNM 2012-074)

A. Serov, **P. Atanassov**  
Active Support, Consisted of M-N-C/C-N Materials as a Support for Cathode Catalysts for Fuel Cell  
*Provisional Application* 61/596,398 filed on February 8, 2012 (UNM 2012-065)

**Exclusive Option to Pajarito Powder Co.**

A. Serov, K. D. Artyushkova, B. Halevi, **P. Atanassov**  
Cathode Catalysts for Fuel Cell Application Based On M-Ch-N-C Materials (M=Transition Metal, Ch=S, Se and Te)",  
*Provisional Application* 61/593,542 filed on February 1, 2012 PCT/US13/24477 (UNM 2012-057)

**Exclusive License to Pajarito Powder Co.**

A. Serov, B. Halevi, U. Martinez, M. Padilla, A. Falase, M. Visitacion, K. Artyushkova, **P. Atanassov**,  
Silver-based Catalyst for Effective Oxidation of Organic and Inorganic Fuels  
*Provisional Application* 61/538,184 filed on September 23, 2011 (UNM 2012-021)

W. Patterson, **P. Atanassov**, A. Serov, C. Walker,  
Hierarchically Structured Carbonaceous Materials Derived from Microemulsion Templating  
*Provisional Application* 61/535,408 filed with the USPTMO on September 16, 2011 (UNM 2012-016)

B. Kiefer, S. Kattel, **P. Atanassov**,  
Material Template for High-Density Data Storage  
*Provisional Application* 61/516,068 filed on March 29, 2011 (UNM 2011-066)

### **Bulgarian (Expired) Patents (6)**

**P. Atanassov**, A. Kaisheva, S. Gamburzev and I. Iliev  
Mediated Glucose Enzyme Electrode  
*Bulgarian Patent No: 94464*, Filed: 1992, Issued: 1993, Renewed as Private: July 15, 1993

S. Gamburzev, A. Kaisheva, I. Iliev and **P. Atanassov**  
Method for Preparation of Electrocatalyst for Bi-functional Oxygen Gas-diffusion Electrodes  
*Bulgarian Patent No: 93611*, Filed: 1991, Issued: 1992, Renewed as Private: July 14, 1993

S. Gamburzev, A. Kaisheva, I. Iliev and **P. Atanassov**  
Bi-functional Electrode for Electrochemical Reduction and Evolution of Oxygen in Alkaline Electrolytes  
*Bulgarian Patent No: 94463*, Filed: 1991, Issued: 1992, Renewed as Private: July 15, 1993

**P. Atanassov**, S. Gamburzev, A. Kaisheva and I. Iliev

Hydrogen Peroxide Electrode for Bioelectrochemical Determination of the Concentration of Biologically-Active Compounds in Aqueous Solutions and Method for Preparation of the Same

*Bulgarian Patent No: 89188, Filed: 1990, Issued: 1991, Renewed as Private: July 8, 1993*

S. Gamburgzev, **P. Atanasov**, A. Kaisheva and I. Iliev

Method for Preparation of Electrocatalysts for Gas-diffusion Electrodes

*Bulgarian Patent No: 90815, Filed: 1990, Issued: 1992, Renewed as Private: July 7, 1993*

**P. Atanasov**, A. Kaisheva, S. Gamburgzev, and I. Iliev

Method for its Preparation of Enzyme Electrode Using Hydrophobized Carbon Material

*Bulgarian Patent No: 87224, Filed: 1988, Issued: 1989, Renewed as Private: July 8, 1993*

**FUNDED PROPOSALS:**

- **Sandia National Laboratories** (Sandia-University Research Program) 10/1/00-09/30/02  
 Title: “*New Generation Electrocatalysts for Proton Exchange Membrane Fuel Cells*” Amount: \$60,000  
 This is a start-up support program for junior faculty provided by Sandia National Laboratory.
- **Motorola** (Instrumentation Donation) 02/01/2001  
 Title: “*Basic Electrochemical Instrumentation*” Amount: \$25,000  
 Donation of used equipment: a set of key electrochemical instruments received as a donation from Motorola Labs.
- **NSF/UNM Ceramics and Composite Materials Center** (IAB Project) 04/1/01-03/31/05  
 Title: “*Electrocatalysts for Direct Methanol Fuel Cells*” Amount: \$100,000  
 This is an industry-university technology development program funded by The Industrial Advisory Board.
- **DOE - Waste Management Education and Research Consortium** (Seed Project) 11/1/01-02/28/02  
 Title: “*Environmental Sensors with Electrochemical Detection of Enzyme Label*” Amount: \$16,000  
 This is a start-up support program for junior faculty provided by WERC in areas of environmental DoE interest.
- **American Cancer Society** (Institution Research Grant) 01/1/02-12/31/02  
 Title: “*DNA sensors with Electrochemical Detection of Enzyme label*” Amount: \$20,000  
 This is a seed funding support program for junior faculty provided by ACS in areas of cancer-related research.
- **DOD - Office of Naval Research** (IRS HSI) Research Proposal 01/1/02-06/30/04  
 Title: “*Bioelectrocatalytic Fuel Cells*” Amount: \$350,000  
 A research proposal under Instrumentation and Research Support for Hispanic Serving Institutions.
- **DOD - Army Research Office** (Workshop Proposal) 04/1/02-08/31/02  
 Title: “*Workshop on Bio- Fuel Cells*” Amount: \$35,000  
 This project supports the organization of the first Bio-Fuel Cells Workshop with 40 presentations and 100 participants.
- **DOD - Army Research Office** (DEPSCoR) 07/1/02-06/30/05  
 Title: “*Non-platinum Electrocatalysts for Fuel Cells*” Amount: \$300,000  
 This is a project to establish materials research in the area of meso-structured electrocatalysts.
- **Motorola** (University Partnership in Research) 10/1/02-09/30/04  
 Title: “*Methanol Tolerant Electrocatalysts for Oxygen Reduction Reaction*” Amount: \$50,000  
 Industry supported research project focused on pyrolyzed macrocycles as electrocatalysts for oxygen reduction.
- **ChNE Department Future Technology Fund** (Instrumentation Donation) May 2003  
 Title: “*Advanced Electrochemical Instrumentation*” Amount: \$7,000  
 Donation toward purchasing of lock-in amplifier and associated software for nano-technology experiments.
- **Sandia National Laboratories** (LDRD Subcontract) 10/1/03-09/30/04  
 Title: “*Nano-structured Arrays based on Anodized Aluminum Oxide*” (D. Brevnov, Co-PI) Amount: \$35,000  
 Program on microsensors development for environmental monitoring.
- **NIH - National Institute of Biomedical Imaging and Bioengineering** (Subcontract to TRI-Princeton) 10/1/03-08/31/05  
 Title: “*Nano-fibrous Support for Biomedical Sensors*”(A. Neimark, PI) Amount: \$100,000  
 This is a subcontract to a proposal funded through TRI-Princeton on the NIH program on new sensors and sensing systems.
- **Cabot Corp.** (CCMC Membership for Industry-Directed Research) 04/1/04-03/31/09  
 Title: “*Oxidation Resistance of Carbonaceous Materials*” Amount: \$180,000  
 This is a company-directed Center project on the oxidation properties of fuel cells electrocatalysts supports.

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**Note:** In the Funded Proposals section, funding figures represent the part that is being administered by P. Atanassov as a Co-PI in cases of multi-investigator awards or represent UNM subcontract if appropriate.

- **DOE - Waste Management Education and Research Consortium** (Research Project) 07/1/04-06/30/05  
 Title: *"Nano-scale Sensor Arrays for Environmental Monitoring"* (D. Brevnov, Co-PI) Amount: \$60,000  
 This program is focused on the development of Anodized Aluminum Oxide based sensors for detection of heavy metals.
- **Intel Corp.** (CCMC Membership for Industry-Directed Research) 09/1/04-08/31/07  
 Title: *"Aluminum Metal/Anodized Aluminum Oxide Composite Structures"* (D. Brevnov, PI) Amount: \$150,000  
 This is a company-directed Center project on the AAO based materials for electronics applications.
- **DOD - Army Research Office, SBIR/STTR Phase II** (Subcontract to Gibbard R&D Corp.) 09/1/04-08/31/06  
 Title: *"Mixed-Field Direct Methanol Fuel Cells"* (A. Kaufman, PI) Amount: \$150,000  
 This is a subcontract to a proposal funded through Gibbard R&D Corp. on the ARO program on new small fuel cells.
- **Los Alamos National Laboratory** (UNM/LANL JSTL) Workshop Proposal 07/1/05-12/31/05  
 Title: *"New Mexico Workshop on Hydrogen and Fuel Cell Technologies"* Amount: \$4,500  
 Workshop aims at building team effort in hydrogen and fuel cell technology in NM: 20 talks and 40 participants.
- **DOD - Army Research Office** (HIS Instrumentation Support) 10/1/05-09/30/06  
 Title: *"Particle Characterization Facility"* (Co-PI is T.L. Ward) Amount: \$200,000  
 Instrumentation proposal which brings TGA-MS, PSA and a FTIR to the joint CMEM characterization facility.
- **DOD – Defense Advanced Research Project Agency (MTO)** through Sandia National Laboratories 05/1/05-04/30/06  
 Title: *"Enzymatic Bio- Fuel Cells"* Amount: \$88,000  
 This is a subcontract to the Sandia NL contract with DARPA on Micro Bio-Fuel Cells.
- **Los Alamos National Laboratory** (Subcontract on a Laboratory-Directed Research Project) 04/1/05-03/31/05  
 Title: *"Magnetic Particle Arrays Derived from Proteins"* Amount: \$10,000  
 This is a subcontract to the CINT program with V. Klimov (LANL) on protein self-assembly.
- **Sandia National Laboratories** (LDRD Sub-contract) 05/1/05-04/30/06  
 Title: *"Micro-Total Analytical Systems Components Design"* Amount: \$35,000  
 This is a subcontract to the Sandia NL LDRD on Micro TAS.
- **DOD - Army Research Laboratory** (Power & Energy Collaborative Technology Alliance) 12/1/05-12/31/07  
 Title: *"Nanostructured Electrocatalysts for Fuel Cells"* Amount: \$96,000  
 This is a DuPont-directed project under the team effort of the ARL to advance portable fuel cell technology.
- **DOD - Air Force Office of Scientific Research** (Multi-University Research Initiative), 05/1/06-04/30/11  
 Title: *"Fundamentals of Enzymatic Fuel Cells"* (Plamen Atanassov, PI) Total Amount: \$3,500,000 UNM: 745,000  
 This large proposal brings together faculty from UNM, Columbia University, Michigan State University, University of St. Louis, University of Hawaii and Northeastern University. UNM is the lead institution and P. Atanassov is the main PI.
- **Toyota Motor Company.** (CCMC Membership for Industry-Directed Research) 04/1/05-03/31/09  
 Title: *"Development of Model Biological Fuel Cells"* Amount: \$200,000  
 This is a company-directed Center project on the bio-fuel cell development focusing on the cathode design.
- NSF – IGERT** (Division of Graduate Education) in collaboration with **NIH-NCI** 09/15/05-09/14/10  
 Title: *"Integrative Nanoscience and Microsystem"* (A. Datye, PI) Amount: \$3,000,000  
 Research fellowships program in support of the NSMS graduate program at UNM. P. Atanassov is a Co-PI
- **DOE – EERE - Hydrogen and Fuel Cell Technology** (Laboratory Research Initiative) 10/1/06-09/30/10  
 Title: *"New Electrocatalysts for Polymer Electrolyte Fuel Cells"* (Piotr Zelenay, LANL, PI) Amount: \$400,000  
 This Subcontract is a part of a LANL-lead collaborative program at the Institute for Hydrogen and Fuel Cell Technology. It includes Brookhaven Natnl. Lab, U. of Illinois, U. of California and UNM. P. Atanassov is the PI of the UNM sub-contract.
- **New Mexico Institute of Mining and Technology** (NM State Hydrogen Initiative) 10/1/06-09/30/10  
 Title: *"Equipment to Study Electrocatalysts for Fuel Cells"* (Don Weinkauf, NMIMT, PI) Amount: \$120,000  
 This is the State of New Mexico cost share account that is set in support of the DOE-LANL sub-contract.
- **Cabot Corp.** (Contract for Industry-Directed Research) 12/01/06-11/30/07  
 Title: *"New Supports for Fuel Cell Electrocatalysts"* Amount: \$75,000  
 This is a company-directed program contracted for one year and renewable pending on a set of deliverables.



- **UNM Center for Biomedical Engineering** (Sandia National Laboratories Bridging Grant) 12/01/06-11/30/07  
 Title: “*High-Throughput Screening of Enzymes for Electrochemical Properties*” Amount: \$17,500  
 This is a seed funding program to develop a new technology directed towards effective enzyme engineering applications.
- **DOD – Defense Advanced Research Project Agency (DSO)** through Sandia National Laboratories 05/1/07-09/30/07  
 Title: “*Enzymatic Bio- Fuel Cells for Implantable Applications*” Amount: \$34,000  
 This is a subcontract to a SNL DARPA-funded exploratory program.
- **Cabot Corp.** (Instrumentation Donation) 06/01/2007  
 Title: “*Fuel Cell Test Station and Chemical Vapor Deposition Setup*” Amount: \$150,000  
 Donation of equipment that will be for dual research/teaching use.
- **UNM Science Technology Corporation** (Technology Gap Funding Grant) 10/01/07-09/31/08  
 Title: “*Multiplex Immunosensors for Rapid Diagnostics of Infectious Disease*” Amount: \$25,000  
 Program to develop UNM technology towards marketing expectations and a potential licensing agreement.
- **NSF – Industry/University Collaborative Research Centers** (Centers Tie Program) 10/1/07-09/30/10  
 Title: “*Thermal Stability in Electrocatalysts for Fuel Cells*” (J. St-Pierre, SCU, A. Datye, UNM, PIs) Amount: \$100,000  
 This is a UNM-USC collaborative project to bridge the research in two NSF I/UCRCs. P. Atanassov is a UNM co- PI.
- **NSF – Industry/University Collaborative Research Centers** (change of PI to P. Atanassov) 10/11/07-08/31/09  
 Title: “*Ceramics and Composite Materials Center*” (UNM component of the award) Amount: \$200,000  
 This is a UNM-Rutgers-Penn State research center. P. Atanassov became a PI of the UNM site to lead the renewal effort.
- **Sharp Laboratories of America** (CCMC Membership for Industry-Directed Research) 04/1/08-03/31/09  
 Title: “*Diagnostics and Electrochemical Characterization of Immunosensing Devices*” Amount: \$35,000  
 This is a company-directed Center project on the immunosensor development focusing on the label-free assay.
- **Sandia National Laboratories** (NSA Sub-contract) 04/1/08-09/30/09  
 Title: “*Materials for Printable Cathodes*” Amount: \$100,000  
 This is a subcontract to the Sandia NL in the area of printable battery technology.
- **Superprotonic Inc.** (Industry-Sponsored Research) 04/1/08-09/30/08  
 Title: “*Processing of Superprotonic Materials*” Amount: \$40,000  
 This is a company-directed exploratory research project in applications of spray pyrolysis technology.
- **Institute for Advanced Studies (NM Consortium)** 07/1/08-06/30/10  
 Title: “*Center for Emerging Energy Technologies*” (Plamen Atanassov, PI) Amount: \$30,000  
 This is a request for structural and operational support for the CEET initiative at SOE.
- **DOE – EPSCoR State of New Mexico Implementation Award** 10/1/08-04/30/13  
 Title: “*Materials for Energy Conversion and Storage*” (Plamen Atanassov, PI) Amount: \$4,125,000  
 State of New Mexico DOE collaborative research proposal with participation from NMT, NMSU and ENMU
- **Akermin Corp.** (CCMC Membership for Industry-Directed Research) 04/1/08-03/31/09  
 Title: “*Development of Anode Catalyst Inks for Biofuel Cells*” Amount: \$20,000  
 This is a company-directed Center project on the development of biofuel cell technology.
- **Daihatsu Corp.** 10/1/08-12/31/11  
 Title: “*Materials for Hydrazine Fuel Cells*” (Plamen Atanassov, PI) Amount: \$520,000  
 This is a company-directed research project on the development of catalyst and membrane technology.
- **DOD - Air Force Research Laboratory** (Major Thrust Set Aside Program for Materials Research) 09/15/08-09/14/11  
 Title: “*Bio/Nano Architectures for Enzyme Catalyzed Energy Conversion*” (Plamen Atanassov, PI) Amount: \$200,000  
 This project is on the area of bio-nano interfaces study with electrochemistry and SPR
- **DOD - Air Force Office of Scientific Research** (MURI Supplements) 10/01/08-09/30/11  
 Title: “*Autonomous & Sustainable Biorenewable Energy & Power*” (Plamen Atanassov, UNM PI) Amount: \$460,000  
 This is the UNM component of a program between WPAFB (R. Pachter) and TAFB (G. Johnson) sites of AFRL.

- **CFDRC** (CCMC Membership for Industry-Directed Research) 04/1/09-03/31/10  
 Title: “*Development of Air-Breathing Enzyme Cathode for Biofuel Cells*” Amount: \$40,000  
 This is a company-directed Center project on the development of biofuel cell technology.
- **DOD – Defense University Research Instrumentation Program (DURIP)** 01/10/09-03/31/10  
 Title: “*Surface Plasmon Resonance Facility*” (Gabriel Lopez, UNM, PI) Amount: \$330,000  
 This project requests two SPR instruments with a state-of-the-art metal evaporation tool.
- **NSF – Major Research Instrumentation (MRI)** 01/10/09-03/31/11  
 Title: “*X-Ray Photoelectron Spectroscopy Surface Characterization Facility*” Amount: \$360,000  
 This project requests an upgrade of the UNM XPS instrument with a state-of-the-art new tool.
- **DOE – EERE Fuel Cell Technology Program** (University Research Initiative) 03/1/10-02/28/13  
 Title: “*Novel Non Pt Group Metal Electrocatalysts for PEMFC*” (S. Mukerjee, NEU, PI) UNM Amount: \$800,000  
 This Subcontract is a part of a NEU-lead collaborative program with P. Atanassov as the PI of the UNM sub-contract.
- **DOE – EERE Fuel Cell Technology Program** (National Laboratories Research Initiative) 03/1/10-02/28/13  
 Title: “*PEMFC Materials Durability Studies*” (R. Borup, LANL, PI, K. Artyushkova, UNM Co-PI) UNM Amnt: \$320,000  
 This Subcontract is a part of a LANL-lead collaborative program with P. Atanassov as Co-PI of the UNM sub-contract.
- **DOE – EERE Fuel Cell Technology Program** (National Laboratories Research Initiative) 03/1/10-02/28/13  
 Title: “*Non-carbon Supports for PEMFC*” (E. Brosha, LANL, PI, T. Ward, UNM Co-PI) UNM Amount: \$225,000  
 This Subcontract is a part of a LANL-lead collaborative program with P. Atanassov as Co-PI of the UNM sub-contract.
- **DOE – EERE Fuel Cell Technology Program** (National Laboratories Research Initiative) 03/1/10-02/28/13  
 Title: “*Non-carbon Supports for PEMFC*” (F. Garzon, LANL, PI, A. Datye, UNM Co-PI) UNM Amount: \$800,000  
 This Subcontract is a part of a LANL-lead collaborative program with P. Atanassov as Co-PI of the UNM sub-contract.
- **DOE – EERE Fuel Cell Technology Program** (Business Research Initiative) 03/1/10-02/28/13  
 Title: “*Development of Micro-structural Mitigation Strategies for PEMFC*” (S. Wessel, BPS, PI) UNM Amount: \$900,000  
 This Subcontract is a part of a Ballard-lead collaborative program with P. Atanassov as the PI of the UNM sub-contract.
- **DOE – EERE Hydrogen Storage Program** (NREL Hydrogen Storage Center) 03/1/10-02/28/13  
 Title: “*Development of Nano-structured Materials for Hydrogen Storage*” (T. Gannett, NREL, PI) Amount: \$50,000  
 This subcontract is a part of a NREL-lead collaborative program in hydrogen storage by spill-over.
- **Akermin Corp.** (AFOSR STTR Phase I) 05/1/10-02/28/11  
 Title: “*Hierarchically Structured Bioelectrocatalyst Materials Design*” Amount: \$30,000  
 This is a technology transfer project on the interface of non-PGM electrocatalysis and biofuel cell technology.
- **Lynnntech Corp.** (AFOSR STTR Phase I and Phase II) 05/1/10-02/28/13  
 Title: “*Self-powered Biosensors*” Amount: \$280,000  
 This is a technology transfer project on the interface of biosensor and biofuel cell technology.
- **Sandia National Laboratories** (LDRD Sub-contract) 10/28/10-03/31/11  
 Title: “*Printable Lithium Batteries*” Amount: \$60,000  
 This is a subcontract to the Sandia NL in the area of printable battery technology.
- **Sandia National Laboratories** (LDRD Sub-contract) 01/24/11-09/30/13  
 Title: “*Cathode Catalysts for Anion Exchange Membrane Fuel Cells*” Amount: \$195,000  
 This is a subcontract to the Sandia NL in the area of electroplating.
- **Universal Technologies** (AFRL Sub-contract) 03/01/11-09/30/11  
 Title: “*Cathode Catalysts for Anion Exchange Membrane Fuel Cells*” Amount: \$48,000  
 This is a subcontract to the AFRL in the area of biofuel cell technology prototyping.
- **Sandia National Laboratories** (LDRD Sub-contract) 08/15/11-08/14/12  
 Title: “*Electroplating and Electroforming of Allows*” Amount: \$25,000  
 This is a subcontract to the Sandia NL in the area of AEMFC where UNM provides cathode catalysts.

## New Programs – Awarded 2012

- **DOD - Air Force Office of Scientific Research** (Bioenergy Program) 04/01/12-03/31/16  
 Title: “*3D Enzymatic Nanomaterials Architectures for Energy Harvesting*” (Plamen Atanassov, Co-PI) Amount: \$800,000  
 This is the UNM component of a program led by Columbia U, that includes also U Utah and U Washington.
- **NSF – Chemical, Biological and Transport Systems** (Biosensors Program) 04/01/12-03/31/14  
 Title: “*Supramolecular Bio-nano-architectures as Biosensing Platforms*” (P. Atanassov, PI) Amount: \$200,000  
 This is the UNM component of a collaborative research program with U Utah.
- **CFDRC** (AFOSR STTR Phase II) 10/1/12-09/30/14  
 Title: “*Hierarchically Structured Bioelectrocatalyst Materials Design*” Amount: \$250,000  
 This is a technology transfer project on the interface of non-PGM electrocatalysis and biofuel cell technology.
- **CFDRC** (AFRL SBIR Phase I) 10/1/12-04/30/13  
 Title: “*Paper-Based, Multi-Fueled Enzymatic Fuel Cell System*” Amount: \$25,000  
 This is a technology transfer project on the UNM paper-based biofuel cell technology.
- **CFDRC** (ARO SBIR Phase I) 10/1/12-04/30/13  
 Title: “*Paper-Based, Multi-Fueled Enzymatic Fuel Cell System*” Amount: \$25,000  
 This is a technology transfer project on the UNM enzyme immobilization technology.
- **Daihatsu Corp. Japan** 10/1/12-09/30/16  
 Title: “*Materials and Technologies for Hydrazine Fuel Cells*” (Plamen Atanassov, PI) Amount: \$800,000  
 This is a company-directed research project on the development of catalyst and sensor technology.

**Note: all currently active awards are highlighted in “maroon” font.**