



Exponent®

Engineering & Scientific Consulting

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Professional Profile

Dr. Torelli specializes in corrosion science and other industrially relevant electrochemical processes such as lithium-ion battery failure analysis and manufacturing support. As a Certified Fire and Explosion Investigator (CFEI), Dr. Torelli has been involved with a number of fire investigations related to lithium-ion batteries, consumer electronics, and public utilities such as electricity and natural gas transmission and distribution.

During Dr. Torelli's time at Exponent, he has worked with lithium-ion batteries for a variety of applications including consumer electronics, electric vehicles, residential and grid scale energy storage systems, and micromobility. His product failure work has focused on root cause analysis of failures related to fire investigations, product recalls, and safety related issues. Dr. Torelli has helped clients in numerous fields including international arbitration and US, UK, and European based litigation, medical device manufacturing and regulations, automotive and aerospace failures, and consumer product safety.

His corrosion expertise spans several fields including: failure analysis and proactive testing of medical devices, corrosion assessment and prevention of utility company assets, and electrochemical issues related to consumer electronics. He has experience in general and localized corrosion, galvanic corrosion, fretting corrosion, stress corrosion cracking, sulfidation and carburization, corrosion under extreme environments including acidic and high temperature environments, and protective coatings. Dr. Torelli has worked on corrosion related issues on a variety of materials including aluminum alloys, stainless steels, titanium containing alloys, copper based alloys, and noble metals such as silver and gold.

Prior to joining Exponent Dr. Torelli conducted research in the fields of electrochemistry, materials science, and polymeric materials. He developed an expertise in various materials characterization techniques as well as electrochemical testing. As a National Science Foundation (NSF) Fellow at Caltech, he conducted research on the discovery of electrocatalysts capable of converting carbon dioxide into chemically useful products. Through this work he developed aqueous, non-aqueous, and high pressure CO₂ reduction systems interfaced with various analytical techniques such as gas or liquid chromatography, mass spectroscopy, and nuclear magnetic resonance spectroscopy. In addition, Dr. Torelli has conducted research on electropolymer coatings, inorganic and organometallic compounds, nanoparticles, and semiconductor materials. He has worked with wafer applied materials to improve the reliability of microelectronic applications.

Academic Credentials & Professional Honors

Ph.D., Chemistry, California Institute of Technology (Caltech), 2018

B.S., Chemistry, University of North Carolina, Chapel Hill, 2013

National Science Foundation Graduate Research Fellowship: 2014-2016

American Chemical Society Undergraduate Award in Inorganic Chemistry: 2013

Professional Affiliations

Member of Gamma Sigma Epsilon Chemistry Honors Society: 2012 Inductee

Publications

1. Spece, H.; Underwood, R.J.; Baykal, D.; Eiselstein, L.E.; Torelli, D.A.; Klein, G. R.; Lee, G.C.; Kurtz, S.M.; Is There Material Loss at the Conical Junctions of Modular Components for Total Knee Arthroplasty? *J. Arthroplasty*, 2019, 34(10), 2479-2486.
2. Landers, A.T.; Fields, M.; Torelli, D.A.; Xiao, J.; Hellstern, T.R.; Francis, S.A.; Tsai, C.; Kibsgaard, J.; Lewis, N.S.; Chan, K.; Hahn, C.; and Jaramillo, T.F.; *ACS Energy Letters*, 2018, 3 (6), 1450-1457
3. Francis, S.A.; Velazquez, J.M.; Ferrer, I.M.; Torelli, D.A.; Guavarra, D.; McDowell, M.T.; Sun, K.; Zhao, X.; Saadi, F.; John, J.; Richter, M.; Papadantonakis, K.M.; Brunschwig, B.S.; Lewis, N.S.; Reduction of CO₂ (aq) to 1-Propanol at MoS₂ Electrodes, *Chem. Mater.* 2018, 30, 15, 4902-4908
4. Ulissi, Z.W.; Tang, M.T.; Xiao, J.; Liu, X.; Torelli, D.A.; Karamad, M.; Cummins, K.; Hahn, C.; Lewis, N.S.; Jaramillo, T.F.; Chan, K.; Norskov, J.K.; Machine-Learning Methods Enable Exhaustive Searches for Active Bimetallic Facets and Reveal New Active Site Motifs for CO₂ Reduction. *ACS Catal.* 2017, 7, 10, 6600-6608.
5. Wiensch, J.D.; John, J.; Torelli, D.A.; Velazquez, J.M.; Pieterick, A.; McDowell, M.T.; Sun, K.; Zhao, X.; Brunschwig, B.B.; Lewis, N.S.; A Comparative Study in Acidic and Alkaline Media of the Interplay of pH and Surface Morphology on the Hydrogen-Evolution Reaction on MoS₂ and MoSe₂, *ACS Energy Letters*, 2017, 2, 10, 2234-2238.
6. Kim, Y.G.; Javier, A.; Baricuatro, J.H.; Torelli, D.A.; Cummins, K.D.; Tsang, C.F.; Hemminger, J.C.; Soriaga, M.P.; Surface Reconstruction of Pure-Cu Single-Crystal Electrodes Under CO-Reduction potentials in alkaline solutions: A Study by Seriatim ECSTM-DEMS. *J. Electroanal. Chem.* 2016, 780, 290-295.
7. Torelli, D.A.; Francis, S.A.; Crompton, J.C.; Javier, A.; Thompson, J.R.; Brunschwig, B.S.; Soriaga, M.P.; Lewis, N.S.; Nickel-Gallium Catalyzed Electrochemical Reduction of CO₂ to Highly Reduced Products at Low Overpotentials. *ACS Catal.* 2016, 6, 3, 2100-2104.
8. Antunez, D.P.; Torelli, D.A.; Yang, F.; Rabuffetti, F.A.; Lewis, N.S.; Brutchey, R.L.; Low Temperature Solution-Phase Deposition of SnS Thin Films. *Chem. Mater.* 2014, 26, 5444-5446.
9. Ashford, D.L.; Lapidés, A.M.; Vannucci, A. K.; Hanson, K.; Torelli, D. A.; Harrison, D. P.; Templeton, J.L.; Meyer, T.J.; Water Oxidation by an Electropolymerized Catalyst on Derivatized Mesoporous Metal Oxide Electrodes. *J. Am. Chem. Soc.* 2014, 136 (18), 6578-6581.
10. Lapidés, A.M.; Ashford, D.L.; Hanson, K.; Torelli, D.A.; Templeton, J.L.; Meyer, T.J., Stabilization of a Ruthenium(II) Polypyridyl Dye on Nanocrystalline TiO₂ by an Electropolymerized Overlay, *J. Am. Chem. Soc.* 2013, 135 (41), 15450-15458.
11. Torelli, D. A.; Harrison, D. P.; Lapidés, A. M.; Meyer, T. J., Strategies for Stabilization of Electrodeposited Metal Particles in Electropolymerized Films for Water Oxidation and Proton Reduction, *ACS Appl. Mater. Interfaces*, 2013, 5(15), 7050-7057.

12. Kent, C.A.; Concepcion, J.J.; Dares, C.J.; Torelli, D.A.; Rieth, A.J.; Miller, A.S.; Hoertz, P.G.; Meyer, T.J., Water Oxidation and Oxygen Monitoring by Cobalt-Modified Fluorine-Doped Tin Oxide Electrodes, *J. Am. Chem. Soc.* 2013, 135(23), 8432-8435.

13. Harrison, D. P.; Lapides, A. M.; Binstead, R. A.; Concepcion, J. J.; Méndez-Agüidelo, M. A.; Torelli, D. A.; Templeton, J. L.; Meyer, T. J., Coordination Chemistry of Single-Site Catalyst Precursors in Reductively Electropolymerized Vinylbipyridine Films, *Inorg. Chem.* 2013, 52 (9), 4747-4749.

14. Hanson, K.; Torelli, D. A.; Vannucci, A. K.; Brennaman, M. K.; Luo, H.; Alibabaei, L.; Song, W.; Ashford, D. L.; Norris, M. R.; Glasson, C. R. K.; Concepcion, J. J.; Meyer, T. J., Self-assembled Bilayer Films of Ru(II) Polypyridyl Complexes by Layer-by-Layer Deposition on Nanostructured Metal Oxides, *Angew. Chem. Int. Ed.* 2012, 51 (51), 12782-12785.

Presentations

D. Torelli, "Discovery of New Electrocatalysts for the Direct Conversion of CO₂ to Hydrocarbon Fuels", Invited speaker at Gordon Research Seminar: Carbon Capture, Utilization and Storage, New London, New Hampshire, 2018.

D. Torelli, "Discovery of New Electrocatalysts for the Direct Conversion of CO₂ to Hydrocarbon Fuels", Invited speaker at Department of Energy EFRC Team Science Competition, Washington D.C., 2018.