NATIONAL RENEWABLE ENERGY LABORATORY

Fuel Cell System Contaminants Publications and Presentations

View publications and presentations about the effect of system-derived contaminants on polymer electrolyte membrane fuel cell (PEMFC) performance and durability. The lists are organized by calendar year.

2015

Publications

1. Huyen N. Dinh, Guido Bender, Clay Macomber, and Heli Wang, "Effect of System Contaminants on PEMFC Performance and Durability," Section V.E.3 in 2015 DOE Hydrogen and Fuel Cells Program Annual Progress Report (2015): V113-V118.
2. Md. Opu, Guido Bender, Clay S. Macomber, John W. Van Zee, and Huyen N. Dinh, "Understanding the Effects of PEMFC Contamination from Balance of Plant Assembly Aids Materials: In Situ Studies," *Journal of the Electrochemical Society* 162 (2015): F1011-F1019.
3. Hyun-Seok Cho, Mayukhee Das, Heli Wang, Huyen N. Dinh, and J. W. Van Zee, "The Contamination Mechanism and Behavior of Amide Bond Containing Organic Contaminant on PEMFC," *Journal of the Electrochemical Society* 162 (2015): F427-F435.
4. U.S. DRIVE, "System Contaminant Library to Aid Research Community," in *2014 U.S. DRIVE Highlights of Technical Accomplishments* (2015): 41.
5. Huyen N. Dinh, "Making Fuel Cells Cleaner, Better, and Cheaper," NREL Highlights in Research and Development, NREL/FS-5900-63382 (Golden, CO: NREL, 2015).

Presentations

1. Huyen N. Dinh, Guido Bender, Heli Wang, Clay S. Macomber, and Leah McGovern, "Effect of Caprolactam and Sulfate System-Derived Contaminants on Catalyst Activity and PEMFC Performance," presented at the 228th Electrochemical Society Meeting, Phoenix, AZ, October 14, 2015. Abstract #1507.
2. Huyen N. Dinh, "Overview of System Contaminant Effects on Fuel Cell Performance, presented at the 3rd International Workshop on Degradation Issues of Fuel Cells and Electrolyzers," Santorini, Greece, October 1, 2015.
3. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the 2015 DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting, Arlington, VA, June 10, 2015.
4. Charles Staub, Jason Christ, Guido Bender, Clay Macomber, Heli Wang, and Huyen N. Dinh, "Multiple Advance Diagnostics to Probe the Effect of Balance of Plant Materials

on Fuel Cell Performance," presented at the 227th Electrochemical Society Meeting, Chicago, IL, May 2015. Abstract #1599.

5. Huyen N. Dinh, Jason Christ, Clay Macomber, Guido Bender, Charles Staub, and Paul Yu, "Effect of System Contaminants on PEMFC Performance and Durability," Fuel Cell Tech Team Meeting, Southfield, MI, February 11, 2015.

2014

Publications

1. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," Section V.F.1 in *2014 DOE Hydrogen and Fuel Cells Program Annual Progress Report* (2014): V128-V132.
2. Jason M. Christ, K.C. Neyerlin, Ryan Richards, and Huyen N. Dinh, "Concentration Effects of Polymer Electrolyte Membrane Degradation Products on Oxygen Reduction Activity for Three Platinum Catalysts," *Journal of the Electrochemical Society* 161 (2014): F1360-F1365.
3. Jason M. Christ, K.C. Neyerlin, Heli Wang, Ryan Richards, and Huyen N. Dinh, "Impact of Polymer Electrolyte Membrane Degradation Products on Oxygen Reduction Activity for Platinum Electrocatalysts," *Journal of the Electrochemical Society* 161 (2014): F1481-F1488.
4. Heli Wang, Clay S. Macomber, Jason Christ, Guido Bender, Bryan Pivovar, and Huyen N. Dinh, "Evaluating the Influence of PEMFC System Contaminants on the Performance of Pt Catalyst via Cyclic Voltammetry," *Electrocatalysis* 5 (2014): 62-67.
5. Paul Taichiang Yu, Eric A. Bonn, and Balsu Lakshmanan, "Impact of Structural Plastics as Balance of Plant Components on Polymer Electrolyte Membrane Fuel Cell Performance," *ECS Transactions* 58 (2013): 665-680.

Presentations

1. Jason Christ, Charles Staub, K.C. Neyerlin, Ryan Richards, and Huyen N. Dinh, "Effect of Organic Model Compound Contaminants on Platinum Catalysts," presented at the 226th Electrochemical Society Meeting, Cancun, Mexico, October 9, 2014.
2. Huyen N. Dinh, Jason M. Christ, Clay Macomber, Charles Staub, Guido Bender, and Heli Wang, "Effect of System Contaminants on PEMFC Performance and Durability," project update to DOE, NREL, Golden, CO, September 24, 2014.
3. Jason M. Christ, K.C. Neyerlin, Ryan Richards, and Huyen N. Dinh, "Adsorption Characteristics of Polymer Electrolyte Membrane Chemical Degradation Products and Their Impact on Oxygen Reduction Reaction Activity for Platinum Catalysts," presented at the American Chemical Society Meeting, San Francisco, CA, August 2014.
4. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the 2014 DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting, Washington, DC, June 18, 2014.
5. Huyen N. Dinh, "An Overview of NREL's Online Data Tool for Fuel Cell System-Derived Contaminants," DOE Fuel Cell Technologies Office Webinar, May 27, 2014.

6. Jason M. Christ, "Adsorption Characteristics of Polymer Electrolyte Membrane Chemical Degradation Products and their Impact on Oxygen Reduction Reaction Activity for Platinum Catalysts," Colorado School of Mines Chemistry Departmental Seminar, Golden, CO, April 2014.
7. Jason M. Christ, K.C. Neyerlin, Ryan Richards, and Huyen N. Dinh, presentation at the Electrochemistry Gordon Research Conference, Ventura, CA, January 2014.
8. Huyen N. Dinh, Paul T. Yu, and John Weidner, "Effect of System Contaminants on PEMFC Performance and Durability," presentation to the DOE Fuel Cell Tech Team, January 15, 2014.

2013

Publications

1. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," Section V.E.1. in *DOE Hydrogen and Fuel Cells Program 2013 Annual Progress Report* (2013): V129-V134.
2. Jason M. Christ, K. C. Neyerlin, Heli Wang, Ryan Richards, and Huyen N. Dinh, "Impact of Polymer Electrolyte Membrane Degradation Products on the Activity of the Oxygen Reduction Reaction for Platinum Catalysts," *ECS Transactions* 50 (2013): 691-700.
3. Heli Wang, Clay S. Macomber, and Huyen N. Dinh, "Evaluation of PEMFC System Contaminants on the Performance of Pt Catalyst Via Cyclic Voltammetry," *ECS Transactions* 50 (2013): 659-669.
4. Md Safaruddin Opu, Masato Ohashi, Hyun-Seok Cho, Clay S. Macomber, Huyen N. Dinh, and John W. Van Zee, "Understanding the Effects of Contaminants from Balance of Plant Assembly Aids Materials on PEMFCs-In Situ Studies," *ECS Transactions* 50 (2013): 619-634.
5. Clay S. Macomber, Jason Christ, Heli Wang, Bryan S. Pivovar, and Huyen N. Dinh, "Characterizing Leachant Contaminants from Fuel Cell Assembly Aids, a Prelude to Effects on Performance," *ECS Transactions* 50 (2013): 603-618.
6. Hyun-Seok Cho, "Understanding the Effect of BOP Contaminants on Proton Exchange Membrane Fuel Cells: Fundamental Mechanisms, Functional Groups, and Models," Ph.D. Dissertation, University of South Carolina. *Theses and Dissertations* (Paper 571), 2013.

Presentations

1. Paul Taichiang Yu, Eric A. Bonn, and Balsu Lakshmanan, "Impact of Structural Plastics as Balance of Plant Components on Polymer Electrolyte Membrane Fuel Cell Performance," presented at the 224th Meeting of the Electrochemical Society, San Francisco, CA, October 30, 2013. ECS Abstract #1368.
2. Hyun-Seok Cho and John W. Van Zee, "An Isothermal Model for Predicting Performance Loss in PEMFCs from BOP Leachates," presented at the 224th Meeting of the Electrochemical Society, San Francisco, CA, October 27, 2013. ECS Abstract #1260.

3. Mayukhee Das, K.C. Neyerlin, John W. Van Zee, and Huyen N. Dinh, "Studying the Poisoning Effect of an Assembly Aids Material and Relating it to the Species Found in the Material Leachate," presented at the 224th Meeting of the Electrochemical Society, San Francisco, CA, October 29, 2013. ECS Abstract #1331.
4. Masato Ohashi, John W. Weidner, John W. Van Zee, and Huyen N. Dinh, "Leaching Studies of Assembly Aids for Balance of Plant of PEM Fuel Cells," presented at the 224th Meeting of the Electrochemical Society, San Francisco, CA, October 29, 2013. ECS Abstract #1336.
5. Md. Opu, Guido Bender, Huyen N. Dinh, Masato Ohashi, and John W. Van Zee, "Effect of Operating Parameters and Contaminant Feed Rate on PEMFCs Contamination from Polyglycol Dimethacrylate Based Assembly Aids," presented at the 224th Meeting of the Electrochemical Society, San Francisco, CA, October 29, 2013. ECS Abstract #1335.
6. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the 2013 DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting, Washington, DC, May 14, 2013.
7. Huyen N. Dinh, Clay S. Macomber, Mayukhee Das, Md. Opu, Hyun-Seok Cho, K. C. Neyerlin, Heli Wang, Guido Bender, Masato Ohashi, and John W. Van Zee, "Understanding the Effects of Contaminants from Balance of Plant Materials on Fuel Cell Performance," invited presentation at the 2013 MRS Spring Meeting, San Francisco, CA, April 4, 2013.
8. Huyen N. Dinh and Guido Bender, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the DOE Durability Working Group Meeting, Arlington, VA, February 28, 2013.
9. Jason M. Christ, K. C. Neyerlin, Ryan Richards, and Huyen N. Dinh, "Impact of Polymer Electrolyte Membrane Chemical Degradation Products on Oxygen Reduction Reaction Activity for Platinum Catalysts," presented at the Conference on Earth and Energy Research, Golden, CO, February 22, 2013.
10. Huyen N. Dinh and Guido Bender, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the DOE Mid-Year Review, NREL, Golden, CO, February 21, 2013.

2012

Publications

1. Huyen Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," Section V.B.1. in *DOE Hydrogen and Fuel Cells Program 2012 Annual Progress Report* (2012): V57-V62.

Presentations

1. Huyen N. Dinh and Balsu Lakshmanan, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the Fuel Cell Tech Team Meeting, November 14, 2012.

2. Huyen N. Dinh, Mayukhee Das, K. C. Neyerlin, Md. S. Opu, Heli Wang, Clay S. Macomber, Masato Ohashi, and John W. Van Zee, "Screening Balance of Plant Materials to Understand their Effect on Fuel Cell Performance," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 10, 2012. ECS Abstract #1503.
3. Jason M. Christ, K. C. Neyerlin, Heli Wang, Ryan M. Richards, and Huyen N. Dinh, "Impact of Polymer Electrolyte Membrane Degradation Products on the Activity of the Oxygen Reduction Reaction on Platinum Catalysts," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 9, 2012. ECS Abstract #1342.
4. Heli Wang, Clay S. Macomber, Jason Christ, Guido Bender, Bryan S. Pivovar, Huyen N. Dinh, Rod Reid, Balsu Lakshmanan, Kelly O'Leary, Mayukhee Das, Masato Ohashi, and John W. Van Zee, "Evaluation of PEMFC System Contaminants on the Performance of Pt Catalyst via Cyclic Voltammetry," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 9, 2012. ECS Abstract #1298.
5. Hyun-Seok Cho, Md. S. Opu, Masato Ohashi, and John W. Van Zee, "The Contamination Behavior of Organic Compounds on PEMFC," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 9, 2012. ECS Abstract #1295.
6. Md. S. Opu, Masato Ohashi, Hyun-Seok Cho, Clay S. Macomber, Huyen N. Dinh, and John Van Zee, "Understanding the Effects of Contaminants from Assembly Aids Materials used as Balance of Plant Materials on PEMFCs-In-situ Studies," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 9, 2012. ECS Abstract #1293.
7. Clay S. Macomber, Jason Christ, Heli Wang, Bryan S. Pivovar, and Huyen N. Dinh, "Characterizing Leachant Contaminants from Fuel Cell Assembly Aids, a Prelude to Effects on Performance," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 9, 2012. ECS Abstract #1292.
8. Jason M. Christ, K. C. Neyerlin, Heli Wang, Ryan M. Richards, and Huyen N. Dinh, "Utilizing a Rotating Ring Disk Electrode (RRDE) to Simultaneously Measure Contaminate Species Adsorption effects on Two Different Catalyst Surfaces," presented at the 222nd Meeting of the Electrochemical Society, Honolulu, HI, October 8, 2012. ECS Abstract #100.
9. Huyen N. Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting, Washington, DC, May 16, 2012.
10. Heli Wang, Jason Christ, Clay S. Macomber, Kevin O'Neill, K. C. Neyerlin, Kelly A. O'Leary, Rod Reid, Balsu Lakshmanan, Mayukhee Das, Masato Ohashi, John W. Van Zee, and Huyen N. Dinh, "Effect of Fuel Cell System Contaminants on the Pt Catalyst," presented at the 243rd ACS Meeting in San Diego, CA, March 25–29, 2012. Abstract No. FUEL-34.
11. Jason Christ, K. C. Neyerlin, Heli Wang, Ryan Richards, and Huyen N. Dinh, "Impact of Proton Exchange Membrane Degradation Products on Platinum Catalyst Performance," presented at the Western States Catalysis Club Conference, Boulder, CO, March 9, 2012.

12. Huyen Dinh, Clay S. Macomber, Heli Wang, and Jason Christ, "Effect of System and Air Contaminants on PEMFC Performance and Durability," presented at the DOE Mid-Year Review, Denver, CO, February 7, 2012.

2011

Publications

1. Hyun-Seok Cho, Masato Ohashi, and John W. Van Zee, "The Effect on PEMFC Contamination of Functional Groups of Some Organic Contaminants," *ECS Transactions* 41 (2011): 1487-1499.
2. Jean St-Pierre, "PEMFC Contaminant Tolerance Limit – Foreign Cations in Ionomers," *International Journal of Hydrogen Energy* 36 (2011): 5527-5535.
3. Jean St-Pierre, "PEMFC Contamination Model: Foreign Cation Exchange with Ionomer Protons," *Journal of Power Sources* 196 (2011): 6274-6283.
4. Huyen Dinh, "Effect of System Contaminants on PEMFC Performance and Durability," Section V.B.1. in *2011 DOE Hydrogen and Fuel Cells Program Annual Progress Report* (2011): 640-643.

Presentations

1. Huyen N. Dinh, and Kelly O'Leary, "Effect of System Contaminants on PEMFC Performance and Durability," presented at the Fuel Cell Tech Team Meeting, Southfield, MI, December 14, 2011.
2. Hyun-Seok Cho, Masato Ohashi, C. S. Macomber, Heli Wang, Huyen Dinh, John W. Van Zee, "The Effect on PEMFC Contamination of Functional Groups of Some Organic Contaminants," presented at the 220th Meeting of the Electrochemical Society, Boston, MA, October 13, 2011. ECS Abstract #1137.
3. Jason Christ, Heli Wang, Guido Bender, Ryan Richards, and Huyen N. Dinh, "Impact of Proton Exchange Membrane Degradation Products on the Activity of the Oxygen Reduction Reaction in PEM Fuel Cells," presented at the 220th Meeting of the Electrochemical Society, Boston, MA, October 13, 2011. ECS Abstract #1091.
4. Clay S. Macomber, Heli Wang, Kevin O'Neill, Jason Christ, Mayukhee Das, John W. Van Zee, Kelly A. O'Leary, and Huyen N. Dinh, "Leachant Contaminants and Degradation Schemes of PEM Fuel Cell System Components," presented at the 220th Meeting of the Electrochemical Society, Boston, MA, October 12, 2011. ECS Abstract #1040.
5. Mayukhee Das, Masato Ohashi, Clay S. Macomber, Heli Wang, Huyen Dinh, Kelly A. O'Leary, Rod Reid, Balsu Lakshmanan, and J. Van Zee, "Ex Situ Experiments for Understanding the Effect of Contaminants from Balance of Plant Materials on PEMFCs," presented at the 220th Meeting of the Electrochemical Society, Boston, MA, October 12, 2011. ECS Abstract #1039.
6. Md. S. Opu, Masato Ohashi, Kelly A. O'Leary, Balsu Lakshmanan, Rod Reid, Clay S. Macomber, Heli Wang, Huyen Dinh, and John Van Zee, "In Situ Experiments for

Understanding the Effects of Contaminants from Balance of Plant Materials on PEMFCs," presented at the 220th Meeting of the Electrochemical Society, Boston, MA, October 12, 2011. ECS Abstract #1038.

7. Clay S. Macomber, Heli Wang, Kevin O'Neill, Jason Christ, Guido Bender, Bryan Pivovar, and Huyen N. Dinh, "Identifying Leachant Contaminants and Degradation Schemes of PEM Fuel Cell System Components, Leading to Effects on Performance," presented at the 2011 Fall ACS Meeting, Denver, CO, August 31, 2011.
8. Heli Wang, Clay S. Macomber, Kevin O'Neill, Guido Bender, Bryan Pivovar, Rod Reid, Balsu Lakshmanan, Kelly O'Leary, Mayukhee Das, Masato Ohashi, John W. Van Zee, and Huyen N. Dinh, "Effect of PEMFC System Contaminants on the Performance of Catalyst," presented at the 2011 Fall ACS Meeting, Denver, CO, September 1, 2011.
9. Huyen Dinh, "Effect of System and Air Contaminants on PEMFC Performance and Durability," presented at the 2011 DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting, Arlington, VA, May 13, 2011.
10. Huyen N. Dinh, "Effect of System and Air Contaminants on PEMFC Performance and Durability," presented at the DOE Mid-Year Review, Denver, CO, January 19, 2011.

2010

Publications

1. Huyen Dinh, "Effect of System and Air Contaminants on PEMFC Performance and Durability," Section V.C.4. in *DOE Hydrogen and Fuel Cells Program 2010 Annual Progress Report* (2010): 737-740.
2. Heli Wang, Sidney Coombs, Clay Macomber, Kevin O'Neill, Guido Bender, Bryan Pivovar, and Huyen N. Dinh, "Evaluating Polymeric Materials as Potential Sources of PEMFC System Contaminants," *ECS Transactions* 33 (2010): 1617-1625.
3. Clay Macomber, Heli Wang, Kevin O'Neill, Sidney Coombs, Guido Bender, Bryan Pivovar, and Huyen N. Dinh, "Characterizing Polymeric Leachants for Potential System Contaminants of Fuel Cells," *ECS Transactions* 33 (2010): 1637-1643.
4. Hyun-Seok Cho, Myunghee Jung, Jose Navarro, Masato Ohashi, and John W. Van Zee, "Aniline as Cationic and Aromatic Contaminants in PEMFC," *ECS Transactions* 33 (2010): 1627-1635.

Presentations

1. H. N. Dinh and K. O'Leary, "Effect of System and Air Contaminants on PEMFC Performance and Durability," presented at the Fuel Cell Tech Team Meeting, Southfield, MI, October 28, 2010.
2. C. Macomber, H. Wang, K. O'Neill, S. Coombs, G. Bender, B. Pivovar, and H. N. Dinh, "Identifying Leachant Contaminants of Fuel Cell System Components and Their Effect on Performance," presented at the 218th Meeting of the Electrochemical Society, Las Vegas, NV, October 12, 2010. ECS Abstract #626.

3. H. Wang, S. Coombs, C. Macomber, K. O'Neill, G. Bender, B. Pivovar, and H. N. Dinh, "Developing Ex Situ Testing Methods to Evaluate PEMFC System Contaminants," presented at the 218th Meeting of the Electrochemical Society, Las Vegas, NV, October 12, 2010. ECS Abstract #622.
4. S. Kocha, Project participation in the Durability Working Group Meeting, Las Vegas, NV, October 2010.