

Exponent®
Engineering & Scientific Consulting

Mostafa Ahmadzadeh, Ph.D., P.E.

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Professional Profile

Dr. Ahmadzadeh is a materials engineer with specific expertise in process-structure-property relationships of glass and ceramics in complex systems. He specializes in fracture/fractography of brittle materials and has carried out hundreds of materials failure analysis and forensic investigations involving consumer products, buildings and structures, automobiles, and other engineered systems.

Leveraging his experience in materials science and failure analysis, Dr. Ahmadzadeh supports clients with product development, performance evaluation, materials selection, and materials characterization across a variety of industries. He routinely investigates the condition and behavior of glass and ceramic components involved in dispute resolution matters (litigation, arbitration), including those related to intellectual property and product liability.

In addition, Dr. Ahmadzadeh is experienced in magnetism and magnetic materials. He has conducted research in the synthesis and characterization of magnetic nano-materials with applications in smart devices, sensors, high-density solid-state memories and digital recording fields.

During his PhD and postdoctoral studies, Dr. Ahmadzadeh studied alteration and corrosion mechanisms of alumino-silicate glass systems to formulate durable glass for safe disposal of radioactive wastes. He collaborated with geologists and archaeologists to identify natural glass systems as analogues for radioactive waste glass. Through significant experience in well-equipped characterization labs, he has developed hands-on expertise in X-ray diffraction (XRD) and Rietveld analysis, electron microprobe – scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS) and wavelength dispersive spectroscopy (WDS), differential thermal analysis (DTA) and thermogravimetric analysis (TGA), vibrating sample magnetometry (VSM), polarized-light optical microscopy (petrography), Raman spectroscopy, IR spectroscopy (FTIR), UV-vis spectroscopy, Mössbauer spectroscopy, mechanical testing techniques, and more. Furthermore, Dr. Ahmadzadeh has taught subjects in materials science and engineering at Washington State University.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, Washington State University, 2019

M.Sc., Materials Selection and Characterization, University of Tehran, Iran, 2014

B.Sc., Metallurgy and Materials Engineering, University of Tehran, Iran, 2011

Roy G. Post foundation scholarship (dedicated to the safe management of nuclear wastes), 2018

ACerS Nuclear & Environmental Technology Division students award, MS&T, 2018

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National Science Foundation (NSF) student grant, 12th Pacific Rim conference, 2017

Licenses and Certifications

Professional Engineer Metallurgical, California, #2050

Academic Appointments

Postdoctoral Research Associate, Mechanical & Materials Engineering, Washington State University, 2019-2020

Professional Affiliations

American Ceramic Society (ACerS)

Languages

Farsi

Publications

Balasubramanya N, Sun Z, Ahmadzadeh M, Kamali S, Neuville D, McCloy J, & Goel A, “Impact of non-framework cation mixing on the structure and crystallization behavior of model high-level waste glasses”, Journal of the American Ceramic Society, 105(6), 3967-3985, (2021).

McCloy J, Marcial J, Clarke J, Ahmadzadeh M, Wolff J, Vicenzi E, Bollinger D, Ogenhall E, Englund M, Pearce C, Sjöblom R, Kruger A, “Reproduction of melting behavior for vitrified hillforts based on amphibolite, granite, and basalt lithologies” Scientific reports, 11(1), 1-18, (2021).

Nienhuis E, Smith-Gray N, Cocking G, Marcial J, Zhang Y, Ahmadzadeh M, Goel A, McCloy J, “A comparative study on the effect of Zr, Sn, and Ti on the crystallization behavior of nepheline glass” Journal of Non-Crystalline Solids, 569, 120970 (2021).

Lere-Adams A, Ahmadzadeh M, Smith-Gray N, Bollinger D, Boroughs S, & McCloy J, “In situ crystallization and magnetic measurement of hexaferrite glass-ceramics” AIP Advances, 11(3), 035318, (2021).

Ahmadzadeh M, Scrimshire A, Mottram L, Stennett M, Hyatt N, McCloy J, “Structure of NaFeSiO4, NaFeSi2O6, and NaFeSi3O8 glasses and glass-ceramics”, American Mineralogist: Journal of Earth and Planetary Materials, 105(9),1375-1384, (2020).

Ahmadzadeh M, García-Lasanta C, Housen B, and McCloy J, “Archaeomagnetic dating of vitrified Broborg hillfort in southeast Uppsala, Sweden” Journal of Archaeological Science: Reports, 31, 102311 (2020).

Chen H, Marcial J, Ahmadzadeh M, Patil D, & McCloy J, “Partitioning of rare earths in multiphase nuclear waste glass□ceramics”, International Journal of Applied Glass Science, 11(4), 660-675, (2020).

Moore J, Nienhuis E, Ahmadzadeh M, McCloy J, “Synthesis of greigite (Fe3S4) particles via a hydrothermal method” AIP Advances, 9(3), 035012 (2019).

Khanal L, Ahmadzadeh M, McCloy J, Qiang Y, 'Relationship between Nanostructure-Magnetic Property Induced by Temperature for Iron Oxide Nanoparticles in Vacuum, Ar and O2 Environments', Journal of

Magnetism and Magnetic Materials, 166158, (2019).

Danaei R, Varghese T, Ahmadzadeh M, McCloy J, Hollar C, Saleh MS, Park J, Yanling Z, Panat R, "Ultrafast Fabrication of Thermoelectric Films by Pulsed Light Sintering of Colloidal Nanoparticles on Flexible and Rigid Substrates", Advanced Engineering Materials, 21(1), 1800800 (2019).

McCloy J, Marcial J, Patil D, Saleh M, Ahmadzadeh M, Chen H, Crum JV, Riley BJ, Kamat H, Bréhault A, Goel A, Barnsley KE, Hanna JV, Rajbhandari P, Corkhill CL, Hand RJ, and Hyatt NC, "Glass structure and crystallization in boro-alumino-silicate glasses containing rare earth and transition metal cations: a US-UK collaborative program," MRS Advances, 4 (17-18), 1029-1043 (2019).

Ahmadzadeh M, Olds T, Scrimshire A, Bingham P, McCloy J, “Structure and properties of Na5FeSi4O12 crystallized from 5Na2O-Fe2O3-8SiO2 glass” Acta Crystallographica Section C, 74(12), 1595-1602 (2018).

Ahmadzadeh M, Romero C, McCloy J, “Magnetic analysis of commercial hematite, magnetite, and their mixtures” AIP Advances, 8(5), 056807 (2018).

Deshkar A, Ahmadzadeh M, Scrimshire A, Han E, Bingham P, Guillen D, McCloy J, Goel A, 'Crystallization behavior of iron□and boron□containing nepheline (Na2O●Al2O3●2SiO2) based glasses: Implications on the chemical durability of high□level nuclear waste glasses." Journal of the American Ceramic Society, 102(3), 1101-1121 (2018).

Cao Y, Ahmadzadeh M, Xu K, Dodrill B, McCloy J, "Multiphase Magnetic Systems: Measurement and Simulation" Journal of Applied Physics, 123(2), 023902 (2018).

Ahmadzadeh M, Marcial J, McCloy J, “Crystallization of iron-containing sodium aluminosilicate glasses in the NaAlSiO4-NaFeSiO4 join” Journal of Geophysical Research: Solid Earth, 122(4), 2504-2524 (2017).

Marcial J, Ahmadzadeh M, McCloy J, "Effect of Li, Fe, and B Addition on the Crystallization Behavior of Sodium Aluminosilicate Glasses as Analogues for Hanford High Level Waste Glasses" MRS Advances, 2(10), 549-555 (2016).

Ahmadzadeh M, Ataie A, Mostafavi E, “The effects of mechanical activation energy on the solid-state synthesis process of BiFeO3”, Journal of Alloys and Compounds, 622, 548-556 (2015).

Mostafavi E, Ataie A, Ahmadzadeh M, Palizdar M, Comyn TP, Bell AJ "Synthesis of nano-structured Bi1-xBaxFeO3 ceramics with enhanced magnetic and electrical properties" Materials Chemistry and Physics, 162, 106-112 (2015).

Ahmadzadeh M, Ataie A, Mostafavi E, “Synthesis of nano-structured bismuth ferrite by mechano-thermal route” Advanced Materials Research, 829, 722-726 (2014).

Mostafavi E, Ataie A, Ahmadzadeh M, "Characterization of nano-structured multiferroic bismuth ferrite produced via solid state reaction route" Advanced Materials Research, 829, 683-687 (2014).

Presentations

Ahmadzadeh M, McCloy J, "Iron age Swedish vitrified hillfort: analog for nuclear waste glasses" Oral presentation, 25th International Congress on Glass (ICG) 2019, Boston, MA, June 2019.

Ahmadzadeh M, McCloy J, "Role of iron in sodium aluminosilicates and sodium silicates" Poster presentation, Materials Science and Technology (MS&T) 2018 Conference, Columbus, OH, Oct 2018.

Ahmadzadeh M, McCloy J, "Study of glassy hillforts for nuclear waste applications" Oral presentation, 73rd Annual Northwest Regional Meeting (NORM) of American Chemical Society, Pacific Northwest

National Lab, Richland, WA, June 2018.

Ahmadzadeh M, McCloy J, "Structural role of iron in sodium aluminosilicates and sodium silicates" Oral presentation, American Ceramic Society (ACerS) Glass and Optical Division (GOMD) 2018 meeting, San Antonio, TX, May 2018.

Ahmadzadeh M, McCloy J, "Glass for nuclear waste applications" Invited talk, Seminar in Materials Science and Engineering Program, Washington State University, Pullman, WA, Apr 2018.

Ahmadzadeh M, McCloy J, "Structural role of iron in nepheline-based aluminosilicates for nuclear waste applications" Oral presentation, Waste Management Symposia 2018 Conference, Phoenix, AZ, Mar 2018.

Ahmadzadeh M, McCloy J, "Magnetic analysis of commercial hematite, magnetite and their mixtures" Poster presentation, 62nd Annual Conference on Magnetism and Magnetic Materials (MMM), Pittsburgh, PA, Nov 2017.

Ahmadzadeh M, McCloy J, "Role of Fe in the crystallization of nepheline-based aluminosilicates" Oral presentation, 12th Pacific Rim Conference on Ceramic and Glass Technology (PACRIM 12), including GOMD 2017 meeting, Waikoloa, HI, May 2017.

Ahmadzadeh M, McCloy J, "Crystallization of nepheline-based iron-containing sodium aluminosilicate glasses" Poster presentation, GOMD 2016 meeting, Madison, WI, May 2016.

Ahmadzadeh M, Ataie A, "Synthesis of nano-structured bismuth ferrite by mechano-thermal route" Poster presentation, International Conference on Ultrafine Grained and Nano-Structured Materials (UFGNSM) 2013, Tehran, Iran, Nov 2013.

Project Experience

Flat Glass

Dr. Ahmadzadeh has investigated numerous failures involving architectural glass, including insulating glass units (IGUs) in windows and curtainwall systems, balustrades, security and ballistic glazing, and shower enclosures. Commonly investigated issues include “spontaneous” glass fracture, delamination, seal failure, blemishes, scratches, and low-emissivity coating degradation. He has also conducted advanced materials analysis of state-of-the-art display glass.

Consumer Products

Dr. Ahmadzadeh has examined dozens of fractured glass and ceramic components in consumer products through fractography to identify the root cause of cracking, mechanical property testing, accelerated life testing, and failure recreation testing. Examples of products he has investigated include glassware, tableware, ovenware, cookware, glass pots, and other similar products. His analyses have supported Consumer Product Safety Commission (CPSC) investigations and product safety assessments.

Glass Packaging

Dr. Ahmadzadeh has performed defect analysis and failure investigations of glass bottles, jars, and vials used in food, beverage, and pharmaceutical packaging. His analyses supported process optimization initiatives, informed regulatory compliance activities, contributed to product recall investigations, and assisted dispute resolutions.

Automotive Glazing

Dr. Ahmadzadeh has analyzed fracture and degradation of automotive glass components, including windshields and sunroofs, and has investigated the safety and performance implications of such failures in dispute contexts. His work draws on expertise in laminated and tempered glass systems, fracture behavior, and failure causation.

Glass Surfaces & Chemistry

Dr. Ahmadzadeh has characterized the chemistry of complex, advanced glass systems using state-of-the-art analytical techniques, and has evaluated glass surface chemistry where it is critical to performance in various environmental or usage conditions, including long term storage and commercial suitability of glass components.

Ceramic Components in Engineered Products

Dr. Ahmadzadeh has conducted advanced materials characterization and failure analysis of ceramic components in complex engineered systems, including medical devices, heaters, propulsion devices, and insulators. His evaluations often incorporated analytical methods to assess performance, degradation, and/or failure mechanisms.

Peer Reviews

Journal of Failure Analysis and Prevention

Journal of Non-Crystalline Solids

Journal of Ceramics International

Journal of Alloys and Compounds

Journal of Materials Research

MRS Communications

PLOS One