Exponent®
Engineering & Scientific Consulting

Nate Velez, Ph.D.

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Professional Profile

Dr. Velez leverages advanced materials characterization techniques to investigate materials failures, perform root cause analysis, assist in design validation, and provide insight into the performance of materials.

Specializing in nanoindentation / nanoscratch / nanoDMA testing, scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), and transmission electron microscopy (TEM), Dr. Velez has extensive experience investigating metallic, ceramic, polymeric, and composite materials. He leverages advanced sample preparation techniques, such as cryo-ultramicrotomy, to test and image system level components which are inaccessible by traditional preparation methods.

Recently, Dr. Velez has applied his skillset to support the consumer electronics industry as well as industries relying on polymer thin films. Whether material testing, design verification, or failure analysis, Dr. Velez is ready to assist with full system devices down to raw materials and everything in between.

Before joining Exponent, Dr. Velez investigated deficiencies in conductive microwires as well as inhomogeneities in ion exchange resins as part of a collaboration with the Dow Chemical Company as part of his Ph.D. research. During this time, he also developed a novel small-scale tensile testing method for freestanding polymer thin films, utilizing MEMS devices. This technique enabled in situ tensile testing as well as temperature-controlled dynamic mechanical analysis (DMA) of glassy polymers to investigate extreme ductility and craze suppression observed in ultramicrotomed thin films.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, University of California, Berkeley, 2021

M.S., Materials Science and Engineering, University of California, Berkeley, 2017

B.S., Nanoengineering, University of California, San Diego, 2014

Chancellor’s Fellowship for Graduate Study – UC Berkeley, 2014

Albert Parvin Foundation Scholarship – UC San Diego, 2013

Richard L. and Fern W. Erion & Laidlaw-Erion Scholarship – UC San Diego, 2013

Boeing-IDEA Scholarship – UC San Diego, 2012

Licenses and Certifications

Professional Engineer Metallurgical, California, #2070

Prior Experience

Propulsion Test Technician (Intern), Sierra Nevada Corporation, 2012 - 2012

Aircraft Maintenance Operations Deficiency Analyst, U.S. Air Force, 2008 - 2009

Flightline Expediter and Avionics Systems Craftsman, U.S. Air Force, 2004 - 2008

Publications

Velez, N. R.; Allen, F. I.; Jones, M. A.; Donohue, J.; Li, W.; Pister, K.; Govindjee, S.; Meyers, G. F.; Minor, A. M. Nanomechanical Testing of Freestanding Polymer Films: In Situ Tensile Testing and Tg Measurement. J. Mater. Res. 2021.

Velez, N. R.; Allen, F. I.; Jones, M. A.; Govindjee, S.; Meyers, G. F.; Minor, A. M. Extreme Ductility in Freestanding Polystyrene Thin Films. Macromolecules 2020, 53 (19), 8650–8662.

Allen, F. I.; Velez, N. R.; Thayer, R. C.; Patel, N. H.; Jones, M. A.; Meyers, G. F.; Minor, A. M. Gallium, Neon and Helium Focused Ion Beam Milling of Thin Films Demonstrated for Polymeric Materials: Study of Implantation Artifacts. Nanoscale 2019, 11 (3), 1403–1409.

Allen, F. I.; Velez, N. R.; Jones, M. A.; Meyers, G.; Minor, A. In Situ TEM Nanomechanical Testing of Polymers. Abstr. Pap. Am. Chem. Soc. 2017, 253.

Velez, N. R.; Allen, F. I.; Jones, M. A.; Meyers, G.; Minor, A. M. Development of Quantitative In Situ TEM Nanomechanical Testing for Polymers. Microsc. Microanal. 2017, 23 (S1), 742–743.

Bryks, W.; Wette, M.; Velez, N. R.; Hsu, S.-W.; Tao, A. R. Supramolecular Precursors for the Synthesis of Anisotropic Cu2S Nanocrystals. J. Am. Chem. Soc. 2014, 136 (17), 6175–6178.