

Exponent®
Engineering & Scientific Consulting

Andy Lam, Ph.D.

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Professional Profile

Dr. Lam's technical expertise spans a diverse range of fields, which is leveraged by his background in materials science. His experience and knowledge offer unique insights and solutions to clients' challenges in areas including smartcard ecosystems, consumer electronics, computing hardware, production workflows, and data analytics. His recent work for government agencies and private-sector clients has involved smartcard communication protocols, reliability, wireless performance, PCBA failure analysis, and hardware security. Dr. Lam's efforts also include chip-level security assessments through side channel analysis (SCA) and fault injection (FI) techniques. These penetration testing capabilities are actively expanding, and they may be employed to uncover vulnerabilities and assess the security of smartcards, IoT devices, and other embedded systems where data privacy is a priority.

Dr. Lam has extensive experience with numerous mechanical, chemical, thermal, optical, UHF RFID, and electrical testing programs to assess product performance based on client-specific requirements and industry standards. In addition to solving hardware challenges for clients, Dr. Lam has decompiled binary executables and analyzed assembly code to reverse engineer replacements for legacy software tools. In the process, he iteratively collected operators' feedback to ensure user satisfaction and overall efficiency. On other projects, he worked to streamline and standardize data acquisition, processing, visualization, and reporting through a combination of workflow overhauls, software configuration, customized equipment, and automation scripts.

Prior to joining Exponent. Dr. Lam received his Ph.D. in Materials Science & Engineering from the University of California, Davis. He researched the thermal and atomic stabilities of uranium-iron oxide nanoparticle polymorphs in the contexts of environmental remediation and long-term nuclear waste storage. He developed a method for increasing the concentration and energetic stability of uranium trapped within iron oxide nanoparticles. Using this method, he experimentally synthesized and validated a novel energy-minimized atomic coordination of α-UxFe2-2xO3, which was previously only hypothesized to exist. Additionally, his knowledge of additive manufacturing and mechanical design was regularly leveraged to restore/expand instrumentation capabilities for himself and his colleagues.

Dr. Lam is skilled in thermochemical analytical techniques such as high-temperature oxide melt solution calorimetry (HiTOMS), gas adsorption calorimetry, acid solution calorimetry, differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA). Additional skills include solid-state materials characterization techniques such as X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-Ray Spectroscopy (EDS/EDX), and X-Ray Absorption Spectroscopy (XAS/EXAFS/XANES). His experience in wet chemistry included the handling, synthesis, and management of hazardous and sensitive (radioactive, corrosive, oxidizing, nanoparticulate, etc.) materials.

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Academic Credentials & Professional Honors

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

B.S., Materials Science and Engineering, University of California, Irvine, 2016

Enrique Lavernia Graduate Fellowship, 2020

Jastro-Shields Graduate Research Award, 2019

Towards Outstanding Postgraduate Students (TOPS) Fellowship, 2016

Licenses and Certifications

SOLIDWORKS Certificate in Mechanical Design

Prior Experience

Graduate Student Researcher, UC Davis, 2017-2021

o Peter A. Rock Thermochemistry Laboratory

o Velázquez Research Lab

Lead Teaching Assistant, UC Davis, 2020

Teaching Assistant, UC Davis, 2019

Visiting Researcher, University of Manchester, 2019

o School of Earth & Environmental Science

o Research Centre for Radwaste Disposal

Materials & Design Engineer, Daizen Sport Tuning, 2016-2018

Research Assistant, Mumm Research Group, UCI, 2015-2016

Research Assistant, Mecartney Research Group, UCI, 2014-2015

Materials Science Intern, Western Digital Corporation, 2014-2015

Professional Affiliations

Tau Beta Pi, Engineering Honor Society – California Tau Chapter, member

Publications

Lam, A. (2021). Synthesis, Structure, & Thermodynamics of High Uranium Content Iron Oxides. Ph.D. Dissertation, University of California, Davis. https://escholarship.org/uc/item/3br975x6

Stagg, S.; Morris, K.; Lam, A.; Navrotsky, A.; Velázquez, J.M.; Schacherl, B.; Vitova, T.; Rothe, J.; Galanzew, J.; Neumann, A.; Lythgoe, P.; Abrahamsen-Mills, L.; Shaw, S. (2021). Fe(II) Induced Reduction of Incorporated U(VI) to U(V) in Goethite. Environmental Science & Technology.

DOI:10.1021/acs.est.1c06197.

Lam, A.; Hyler, F.; Stagg, O.; Morris, K.; Shaw, S.; Velázquez, J.M.; Navrotsky, A. (2021). Synthesis and thermodynamics of uranium-incorporated α-Fe2O3 nanoparticles. Journal of Nuclear Materials. DOI:10.1016/j.jnucmat.2021.153172.

Lilova, K., Perryman, J. T., Singstock, N. R., Abramchuk, M., Subramani, T., Lam, A., … Velázquez, J. M. (2020). A Synergistic Approach to Unraveling the Thermodynamic Stability of Binary and Ternary Chevrel Phase Sulfides. Chemistry of Materials. DOI:10.1021/acs.chemmater.0c02648.

Bolandparvaz, A.; Harriman, R.; Alvarez, K.; Lilova, K.; Zang, Z.; Lam, A.; Edmiston, E.; Navrotsky, A.; Vapniarsky, N.; Van De Water, J.; Lewis, J. S. (2019). Towards a nanoparticle-based prophylactic for maternal autoantibody-related autism. Nanomedicine: Nanotechnology, Biology, and Medicine, 21. DOI:10.1016/j.nano.2019.102067.

Peer Reviews

Environmental Science: Processes & Impacts