

Curriculum Vitae

Valentin Pauly

Nuclear Engineering and Radiological Sciences, Ph.D. Candidate

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Objective

Nuclear engineering Ph.D. student with strong interest and experience in nuclear materials. My varied education combined with my skills and knowledge related to nuclear materials gives me tools to conduct cutting-edge research in this domain.

Education

University of Michigan in Ann Arbor

M. S. & Ph. D. Nuclear Engineering and Radiological Sciences, Sept. 2019 to Fall 2024 (expected)

- GPA: 4.0/4.0
- Thesis: Emulation of Neutron-Irradiated T91 Steel Microstructure with Dual-Ion Irradiation Across Reactors and Swelling Regimes (*tentative title*)

University of Wisconsin-Madison

M. S. Nuclear Engineering and Engineering Physics, September 2017 to August 2019

- GPA: 4.0/4.0
- Thesis: Tribological Behavior of Structural Materials at Elevated Temperatures and in Impure Helium Environments for High-Temperature Gas-Cooled Reactor Applications

École Centrale de Lyon, Écully, France

B. S. & M. S. General Engineering, September 2015 to August 2019

- French Grande École
- GPA: 3.89/4.0
- Coursework in material science and nuclear engineering

Classe Préparatoire aux Grandes Écoles, Lycée Henri Poincaré, Nancy, France

from September 2013 to August 2015

- GPA: 3.91/4.0
- Major in Mathematics and Physics with Minor in Engineering Science

Work experience

University of Michigan in Ann Arbor, Dept. of Nuclear Engineering and Radiological Sciences

Research Assistant, from September 2019 to Current

- Advisor: Prof. Gary S. Was
- Designed and conducted 30+ dual-ion ($\text{Fe}^{3+} + \text{He}^{2+}$) irradiation experiments in the Michigan Ion Beam Laboratory to emulate neutron-irradiated microstructure.
- Characterized neutron-irradiated and heavy-ion-irradiated microstructure (cavities, dislocation loops, Ni/Si nanoprecipitates and radiation-induced segregation at grain

boundaries) of austenitic and martensitic steels via TEM (out-of-focus BF, EDS, EELS, on-zone STEM).

- Wrote a MATLAB script to estimate helium partitioning at sinks and cavity growth rate in irradiated T91.

University of Wisconsin-Madison, Dept. of Engineering Physics

Research Assistant, from September 2017 to August 2019

- Advisor: Prof. Kumar Sridharan
- Exposed Incoloy™ 800H and Inconel 617™ in a high-temperature furnace with ppm-level of impurities in helium to mimic HTGR conditions.
- Operated a high-temperature tribometer at Argonne National Laboratory facilities.
- Characterized Inconel™ 617 and Incoloy™ 800HT after impure helium corrosion and tribological tests via SEM, White-light Interferometry, GDOES, XRD, XPS and EDS.

CEA Research Center of Cadarache, Saint-Paul-lez-Durance, France

Engineering Intern, from May 2017 to August 2017

- Adapted and ran an existing core model designed for nuclear data uncertainty propagation in decay heat computation on Linux.
- Wrote a Python code to conduct post-processing analysis of decay heat uncertainty propagation.
- Wrote a report entitled “Experimental validation of nuclear data uncertainty propagation for decay heat computation” used for the validation of a CEA decay heat computation code.

Research Projects

Currently using high-voltage accelerators to irradiate ferritic-martensitic and austenitic steels with Fe and He ions to reproduce the microstructure resulting from nuclear reactor exposure. Studying the effect of temperature (445-570°C), damage level (16-184dpa) and He injection rate (0.22-4.3appmHe/dpa) on the microstructure evolution. Characterizing the microstructure (helium bubbles, voids, dislocations loops, radiation-induced segregation, precipitates & clusters) of neutron-irradiated (BOR-60 up to 86dpa & FFTF up to 184dpa) and dual-ion-irradiated using multiple TEMs (Tecnai F30, JEOL 2100F & FEI Talos F200X).

Skills

Science and Technology Specialties

Nuclear engineering, materials science, transmission electron microscopy, ion irradiation

Computer Skills

MATLAB, Python, MCNP, SRIM, CATIA v5, Microsoft Office

Material Characterization Skills

Conventional/Scanning Transmission Electron Microscopy, X-Ray Diffraction, Scanning Electron Microscopy, X-Ray Photoelectron Spectroscopy, Microhardness Testing, White-light Interferometer (Profilometer), Glow-Discharge Optical Emission Spectroscopy

Languages

Native French, Fluent English (TOEFL iBT 114/120)

Publications

Published

V. Pauly, C. Tesch, J. Kern, M. Clark, D. Grierson, D. Singh, O. Ajayi, K. Sridharan, “High-temperature tribological behavior of structural materials after conditioning in impure-helium environments for high-temperature gas-cooled reactor applications”, *Journal of Nuclear Materials*, 522, 311-323 (2019) <https://doi.org/10.1016/j.jnucmat.2019.05.025>.

V. Pauly, J. Kern, M. Clark, D. Grierson, K. Sridharan, “Wear Performance of Incoloy 800HT and Inconel 617 in Various Surface Conditions for High-Temperature Gas-Cooled Reactor Components,” *Tribology International*, 154, 106715 (2020) <https://doi.org/10.1016/j.triboint.2020.106715>

J. Kern, C. Tesch, M. Clark, **V. Pauly**, D. Grierson, D. Singh, O. Ajayi, K. Sridharan, “Effects of Aluminization via Thermo-Chemical Diffusion on the Wear Behavior of Structural Materials for High-Temperature Gas-cooled Reactors,” *Metallurgical and Materials Transactions A*, 52, 2463-2476 (2021) <https://doi.org/10.1007/s11661-021-06236-2>

S. Taller, **V. Pauly**, Z. Jiao, R. Hanbury, G. S. Was, “Solute segregation and precipitation across damage rates in dual-ion-irradiated T91 steel”, *Journal of Nuclear Materials*, 563, 153626 (2022) <https://doi.org/10.1016/j.jnucmat.2022.153626>

In preparation

V. Pauly et al. “Emulating BOR-60-Irradiated T91 microstructure with Dual-Ion Irradiation up to 72 dpa”, not submitted.

Presentations

V. Pauly, C. Tesch, J. Kern, M. Clark, D. Grierson, D. Singh, O. Ajayi, K. Sridharan, “Tribological Behavior of Structural Materials in High-Temperature Helium Gas-Cooled Reactor Environments” presented at the ANS Student Conference 2018, Gainesville, Florida, April 2018.

V. Pauly, C. Tesch, J. Kern, M. Clark, D. Grierson, D. Singh, O. Ajayi, K. Sridharan, “Tribological Behavior of Structural Materials at Elevated Temperatures and in Impure-Helium Environments for High-Temperature Gas-Cooled Reactor Applications” presented at the ANS Annual Meeting 2018, Philadelphia, Pennsylvania, June 2018.

V. Pauly, C. Tesch, J. Kern, M. Clark, D. Grierson, D. Singh, O. Ajayi, K. Sridharan, “Tribological Behavior of Alloys 800H and 617 at Elevated Temperatures and in Impure Helium Environments” presented at TMS 2019, San Antonio, Texas, March 2019.

S. Taller, **V. Pauly**, Z. Jiao, R. Hanbury, G. S. Was, “Solute segregation and precipitation across damage rates in dual-ion-irradiated T91 steel” presented at MiNeS 2021, Pittsburgh, Pennsylvania, 2021.

V. Pauly, S. Taller, Z. Jiao, G. S. Was, “Effect of Helium Injection Rate on Cavity Microstructure in Dual Ion Irradiated T91 Steel,” presented at MiNeS 2021, Pittsburgh, Pennsylvania, 2021.

V. Pauly, S. Taller, G. S. Was, “Prediction of Neutron-Irradiated Microstructure with Dual-Ion Irradiation up to 72 dpa,” presented at MiNeS 2023, New Orleans, Louisiana, 2023.