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Designing Materials Immune to Helium Damage

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Abstract: Helium implanted into materials operating in fusion reactor environments leads to bubble formation, accelerates void growth, and degrades mechanical properties. Drawing on atomistic modeling and experiments, I propose a strategy for mitigating these effects by trapping He at interfaces, addressing in particular the relation of interface structure to He trapping and He clustering. I show that, under some conditions, He can be stored at interfaces in stable form with tolerable effects on mechanical properties such as tensile strength and shear resistance. Finally, I discuss the potential for designing materials immune to He damage by modifying interface structure to allow for continuous He outgassing.

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Biography: Michael Demkowicz is an Assistant Professor in the Department of Materials Science and Engineering at MIT, where his research focuses on the area of computational design of materials for extreme environments. He received his BS from UT Austin in 2000 and his PhD from MIT in 2005. From 2005 to 2008, he was a Postdoctoral Fellow at the Los Alamos National Laboratory. Dr. Demkowicz has received the LANL Postdoctoral Outstanding Performance Award, John C. Chipman Career Development Chair at MIT, the TMS Early Career Faculty Fellow Award, and the NSF CAREER Award.