Mechanical Characterization of Ion-Irradiated Silicon Carbide by Nanoindentation

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Nuclear power plants require advanced materials that can withstand radiation damage for decades while maintaining structural integrity. Silicon Carbide (SiC) is one such material currently being studied due to its notable strength and hardness, making it a viable material to be used in nuclear reactors. Recent research has shown that SiC engineered on the nanoscale has an increased resistance to radiation due to its ability to prevent the propagation of radiation induced defects.[1] The principal objective of this investigation is to learn how nanoengineered SiC's atomic structure increases its radiation resistance as well as examine if increasing radiation resistance affects the material's mechanical properties.

Since little is known about the mechanical properties of SiC, numerous tests on different types of non-irradiated SiC had to be done to create a point of reference. This was followed by tests on gold-irradiated 6H-SiC which show that radiation had very little effect on the hardness and elastic modulus of the material.

[1] Y. Zhang, M. Ishimaru, T. Varga, T. Oda, C. Hardiman, H. Xue, Y. Katoh, S. Shannon, and W. J. Weber, Nanoscale Engineering of Radiation Tolerant Silicon Carbide, *Phys. Chem. Chem. Phys.*, 14, 13429–13436 (2012).