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Enhanced magnetization of Magnetite Nanoparticles at High-Temperature. LOKENDRA KHANAL, University of Idaho, MOSTAFA AHMADZADEH, JOHN MCCLOY, Washington State University, YOU QIANG, University of Idaho, JOHN S. MCCLOY COLLABORATION — Magnetic nanoparticles (MNPs) have been used promisingly since decades in environmental, and biomedical applications. Recently, iron-based MNPs have been discovered as a potential nanomaterial for nuclear radiation sensing and monitoring system as well. Studies have shown that the superparamagnetic behavior of the magnetite nanoparticles (NPs) becomes ferromagnetic under irradiation at room temperature, which is accompanied by the particles size growth and microstructural evolution. In this work, to simulate the high-temperature core (~500 ^{0}C) of the nuclear reactor, the magnetite NPs synthesized by using magnetron sputtering techniques were heat treated up to 800 ^{0}C. The NPs are then characterized by using vibrating sample magnetometer, scanning electron microscope and X-ray diffraction in order to understand the property-structure relationships and microstructural evolution at the elevated temperature. The results have shown interesting results with the enhanced magnetization of the NPs due to increase in size caused by the agglomeration of the particles at high-temperature. The results we have obtained, and the evolution mechanism will be discussed during this presentation.

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