

693rd ASRC Seminar

Date: Thursday, July 6, 13:30 ~ 15:00

Location: Room 103, ASRC bldg.

Speaker: Dr. Krzysztof Gofryk
(Idaho National Laboratory)

Title: Piezomagnetism and magnetoelastic memory
in uranium dioxide

Abstract: The thermal and magnetic properties of UO_2 , a prime nuclear fuel and thoroughly studied actinide material, remain a long-standing puzzle, a result of strong coupling between magnetism and lattice vibrations. In the talk, I will show that single crystals of UO_2 subjected to strong magnetic fields along 3-fold axes in the magnetic state exhibit the abrupt appearance of positive linear magnetostriction leading to a trigonal distortion. Upon reversal of the field the linear term also reverses sign, a hallmark of piezomagnetism. A switching phenomenon occurs at ~ 18 T, which persists during subsequent field reversals, demonstrating a robust magneto-elastic memory that makes UO_2 the hardest piezomagnet known. A model that stabilizes the 3- k magnetic structure and reproduces the observed phenomena will also be presented. I will discuss implications of these results.

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