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Magnetization reversal, exchange interaction, and switching behavior studies on Ru doped GdCrO3

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Content :

A systematic study on the magnetic properties of Ru doped $GdCrO_3$ (where $0 \leq x \leq 0.15$) have been carried out by low temperature magnetization measurements. Pure $GdCrO_3$ shows the antiferromagnetic (AFM) ordering at 170K and a spin-reorientation transition around 8 K. Surprisingly, the AFM ordering temperature does not show any variation with the tetravalent Ru doping; while, spin-reorientation completely disappears with 5% Ru doping within the investigated temperature region. All these compounds exhibit magnetization reversal under low applied fields in field-cooled (FC) protocol. Highly delocalized 4d orbitals and occupation number of Ru^{4+} result in a decrease of antisymmetric exchange constant (D) with doping. Magnetic relaxation study in FC mode reveals the memory effect of pure $GdCrO_3$. Magnetic field-assisted switching behavior study corroborates that magnetic state (positive or, negative) can easily be switched by the application of magnetic field.

Primary authors : Mr. DALAL, Biswajit (Indian Association for the Cultivation of Science)

Co-authors : Dr. SARKAR, Babusona (Indian Association for the Cultivation of Science) ; Prof. DE, Subodh (Indian Association for the Cultivation of Science)

Presenter : Mr. DALAL, Biswajit (Indian Association for the Cultivation of Science)

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