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Influence of Doping and Pressure on the Magnetic Behavior of SmCrO_3

The magnetic interactions between rare-earth and transition-metal moments are of significant interest in the study of permanent magnets [1-2]. In particular, the interplay between 4f and 3d magnetic moments leads to complex behaviors, giving rise to phenomena such as spin reorientation, exchange bias, multiferroicity, and spin switching [3]. Among rare-earth chromites, SmCrO_3 has been extensively investigated due to its complex magnetic phase diagram and potential multiferroic properties [4]. In rare-earth orthochromites, the Mn substitution at the Cr-site has shown versatile magnetic phenomena, and research on these materials has been revived in recent decades [5]. Many controversies over the microscopic spin configuration remain unsolved, presumably due to the complicated spin and orbit interactions. In the present study, SmCrO_3 was characterized by powder X-ray diffraction and Rietveld refinement, confirming an orthorhombic structure with the Pbnm space group. Magnetization measurements revealed a Néel transition at 192 K and a spin reorientation at 34 K. Mn-doping shifted these transitions to lower temperatures and induced a new low-temperature magnetic phase.

In addition, we also investigated the effect of hydrostatic pressure in Mn-doped SmCrO_3 . Applying pressures up to 1 GPa led to a slight increase in both the Néel and spin reorientation temperatures. Our results highlight Mn-doping and pressure as effective control parameters for tuning magnetic interactions in correlated materials.

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Primary authors: KANWAR, Komal (Forschungszentrum Jülich); Dr PRAKASH, Pulkit (Forschungszentrum Jülich); Prof. ANGST, Manuel (Forschungszentrum Jülich)

Presenter: KANWAR, Komal (Forschungszentrum Jülich)

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