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## Structural characterization of ferroic materials by advanced spectroscopy techniques

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The Synchrotron-based X-Ray Absorption Near-edge Spectroscopy (XANES) and Polarized Neutron Reflectivity (PNR) techniques were employed to investigate the structural properties of  $\text{BiFe}_{1-x}\text{Mn}_x\text{O}_3$  ceramic and Co/CoO/Au multilayer, especially to study the local structure of Mn in  $\text{BiFe}_{1-x}\text{Mn}_x\text{O}_3$  ceramic and to verify the formation of secondary phase in Co/CoO/Au multilayer. Theoretical XANES spectra calculations corroborate with the interpretation of the XANES experimental data. In addition, the Co/CoO/Au multilayer was examined to explore the degree of recovery of the untrained state after the first two field cycles. Such a recovery was expected by field cycling a reorientation field ( $H_{RE}$ ) along a direction of orientation angle ( $\Omega_{RE}$ ) away from the initial field cooling direction. Measurements as a function of  $\Omega_{RE}$  and the strength of  $H_{RE}$  (along each direction) map the influence of  $\Omega_{RE}$  on the reversal mechanism in the layers and thereby the degree of recovery.

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