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Magnetic anomalies in self-assembled SrRuO3 -CoFe2O4 nanostructures studied by Raman spectroscopy YI-CHUN CHEN, YEN-CHIN HUANG, CHIA-HSIEN CHIEN, Department of Physics, National Cheng Kung University, HENG-JUI LIU, YING-HAO CHU, Department of Materials Science and Engineering, National Chiao Tung University — Self-assembled nanostructures with high interface-to-volume ratio usually possess interesting physical properties through the coupling between neighboring materials. In complex-oxide nanocomposites, the interplay of spin, charge, orbital, and lattice degrees of freedom especially provides various functionalities. Our recent study had shown photo-induced magnetization switching in a self-assembled system, CoFe2O4 (CFO)- SrRuO3(SRO), where the CFO nanopillars were embedded in the SRO matrix. Moreover, this system also has significant magnetoresistance behaviors. In this study, we used Raman spectroscopy to investigate the magnetic coupling mechanisms in CFO-SRO nanostructures. Compared to the pure CFO films, the CFO nano-pillars under out-of-plane compressive strain show a slightly increase of A1g(Co)/A1g(Fe) intensity ratio, which corresponds to a migration of Co ions from O-site (oxygen octahedron) to T-site (oxygen tetrahedron). This behavior can be further tuned by external stimulus, such as magnetic fields and temperatures. A strong increase of A1g(Co)/A1g(Fe) ratio together with a discontinuous A1g frequency shift occur at the SRO magnetic transition temperature. This result indicated that the spin-orbital interaction in CFO can be modulated by the SRO magnetic orderings.

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