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Self-assembled magnetic nano-structure with exchange bias and inverted hysteresis[1] MOHAMMAD SAGHAYEZHIAN, ZHEN WANG, HANGWEN GUO, Dep. of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana 70803, USA, YIMEI ZHU, Cond. Matter Physics and Materials Science Dept, Brookhaven National Laboratory, Upton, New York 11973, USA, RONGYING JIN, JIANDI ZHANG, E. W. PLUMMER, Dep. of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana 70803, USA — The competing interactions in transition metal oxides generate rich magnetic phase diagram. In heterostructures, interface between film and substrate often is the key in discovering new functionality. Here we show that it is possible to fabricate and engineer a self-assembled interface in a single thin film material – half metallic $La_{2/3}Sr_{1/3}MnO_3$ –with unusual magnetic behavior by special processing. Transmission electron microscopy & spectroscopy shows clear structural and compositional evidence of the new engineered inherent interface. Consequently, the engineered interface results in complex magnetic properties in a monolithic $La_{1-x}Sr_xMnO_3$ thin film. The thin film exhibits unexpected negative and positive exchange bias that changes exponentially with temperature. Also, the magnetic coupling between layers at each sides of the interface creates a complex ferromagnetic heterostructure that exhibits inverted hysteresis. Our results shed light on a pathway towards fabricating self-assembled interface to manipulate novel physical properties in a monolithic thin film.

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Mohammad Saghayezhian
Dep. of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana 70803, USA

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