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Suppressed Magnetization in $La_{0.7}Ca_{0.3}MnO_3/YBa_2Cu_3O_{7-g}$ Superlattices

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Abstract

Suppressed Magnetization in $La_{0.7}Ca_{0.3}MnO_3/YBa_2Cu_3O_{7-\delta}$ Superlattices

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Ferromagnetic/superconducting heterostructures are the subject of intense research, since these two types of long-range order are generally mutually exclusive. The competition between ferromagnetism and superconductivity has given rise to a rich variety of proximity phenomena. While most research is performed on metallic heterostructures, there is interest in studying these effects in superlattices of high T_c superconductors and colossal magnetoresistance oxides. In both materials the superconducting and ferromagnetic properties are strongly dependent on the charge carrier density and thus charge transfer across the interface may be important for the properties in these heterostructures. In a series of $La_{0.7}Ca_{0.3}MnO_3$(15 u.c.)/$YBa_2Cu_3O_7$(t) Superlattices, SQUID magnetometry showed that the saturation magnetization in the LCMO layers is significantly reduced. Polarized neutron reflectometry determined that the reduced moment is due to an inhomogenous magnetization profile. Specifically, the magnetization in each LCMO layer is suppressed close to the interfaces with the YBCO, possibly due to charge transfer across the interface.