

TUNNELING EVIDENCE OF HALF-METALLIC FERROMAGNETISM IN THE
COLOSSAL MAGNETORESISTIVE $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ AND $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ FILMS*

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Direct evidence of half-metallic density of states (DOS) is observed by scanning tunneling spectroscopy on ferromagnetic $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ and $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ films which exhibit colossal magnetoresistance (CMR). At 77K, well below the Curie temperatures, the normalized tunneling conductance $(dI/dV)/(I/V)$ exhibits pronounced peak structures, showing close resemblance to the spin-split DOS spectrum calculated for the itinerant bands in the ferromagnetic state'. The half-metallic spectral characteristics are absent in the paramagnetic state, as well as in the undoped antiferromagnetic compound LaMnO_3 which shows no CMR. These results are compared with tunneling data taken on ferromagnetic films of the conventional half-metal Fe_3O_4 , and discussed in terms of the role half-metallic ferromagnetism plays in the phenomenon of CMR.

¹ W.E. Pickett and D.J. Singh, Phys.Rev.B 53, 1146 (1996).

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