# Unraveling thickness-dependent spin relaxation in colossal magnetoresistance manganite films

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Using ultrafast optical spectroscopy, we reveal sensitive spin relaxation in 10-100 nm thick $La_{0.7}Ca_{0.3}MnO_3$ films, which are typical thicknesses used in operating devices. The spin-lattice relaxation time displays a strong dependence on thickness below the Curie temperature. Compared with our simulation, it is found that such behavior is due to strong temporal variation of thermal gradient, and the observed faster relaxation is not intrinsic (e.g., due to reduced magnetization [1]), but extrinsic, arising from lattice thermal quenching through the substrate, leading to demagnetization quenching. Furthermore, we provide an analytical way to extract the intrinsic spin relaxation time for highly thermal dissipative films. Our study strongly suggests that careful consideration of transient thermal properties in spin manipulation/demagnetization is mandatory when incorporating absorbing thin magnetic films into heterostructures.[2]

Reference:

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