Current-induced conductance jumps in mechanically controllable junctions of $La_{0.7}Sr_{0.3}MnO_3$ manganese

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9.7 cm

The magnetic switching processes in mechanically controllable junctions (*MCJ*), made of high-quality ceramic of $La_{0.7}Sr_{0.3}MnO_3$, are studied as a function of the DC current (up to 10^9 A/cm^2) passing through the nanoconstriction. The relative displacement of the two electrodes is controlled by the piezodevice with a resolution of a few picometers. The current-voltage ($I - V$) curves of the *MCJ* are typical of an electron tunnelling process. By fitting the $I - V$ curves to the Simmons model the barrier width (0.8-1.6) nm and height (0.7-1.7) eV of the junctions and their effective tunnel area (1-10) $\times 10^{-12}$ cm^2 were estimated. Due to the close relation between transport properties and the magnetization in manganese compounds, the resistivity measurements provide an excellent indirect method to characterize the magnetic switching observed in atomic scale constrictions. Based on this, we interpret the jumps in conductance of *MCJ* about integer multiples of e^2/h as due to the configuration reorientation of the magnetization of the Mn-ions' clusters at the constriction surfaces. Our data suggest a quantum origin of the current-induced switching of the point contact prepared from half-metallic oxide ferromagnets.

13.4 cm

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