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Magnetic and magneto-optical properties of films of multiferroic GdMnO₃ grown on LSAT [(LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7}] (100) and (111)

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Magnetic and Magneto-optical properties of films of multiferroic GdMnO₃ grown on LSAT [(LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7}] (100) and (111)

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Abstract

The magnetic properties of multiferroic GdMnO₃ depend on strain which is produced in a thin film by growing an epitaxial film on a suitable substrate. We report an investigation of the magnetic and optical properties of GdMnO₃, as a function of strain, produced by growing epitaxial films on the substrates on (LaAlO₃)_{0.3}(Sr₂AlTaO₆)_{0.7} (LSAT) (100) and (111). Magnetic measurements have shown that at 5K the easy direction of the film is in-plane for LSAT (100) and the canted moment is significantly smaller than the value found in bulk material but larger than that found for GdMnO₃ on SrTiO₃ (100). The coercive field of the GdMnO₃/LSAT (100) has also been found to be smaller than for bulk single crystal samples but comparable to a thinner film of GdMnO₃ grown on SrTiO₃. The magnetic properties of the film grown on LSAT (111) are very different. The transition to the canted phase is less pronounced and there is no magnetic hysteresis at low temperatures. The susceptibility data are fitted with the Curie's law and the measured magnetic moments for the film on LSAT (100) were similar to bulk values but significantly different for films on LSAT (111) and SrTiO₃

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