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Electrical transport in oxidized iron thin films JOLANTA STANKIEWICZ, JUAN BARTOLOMÉ , ICMA, CSIC-Universidad de Zaragoza, FÉLIX JIMENÉZ-VILLACORTA, CARLOS PRIETO, ICMM, CSIC — We report results of electrical resistivity, Hall effect and anisotropic magnetoresistance (AMR) measurements performed on thin films ($\sim$ 50 nm) of oxidized iron in the temperature range from 10 to 300 K, and in magnetic fields up to 0.6 T. The films were sputtered on naturally oxidized Si(100) substrates whose deposition temperature T_s can be varied between 170 and 300 K. Samples were oxidized at room temperature for 30 minutes, and subsequently capped with a SiO_2 layer in order to prevent further oxidation. By changing T_s during the growth process we can control the size and shape of crystalline grains in these films. We find that the residual resistivity, carrier concentration, coercive field H_c as well as the magnetoresistance of the films are strongly affected by growth conditions, particularly by the substrate temperature. All measured samples are metallic with a room temperature electron concentration of about 2×10^{21} cm^{-3}. As T_s increases, the resistivity at T=10 K decreases from $\approx$ 400 $\mu\Omega$cm (for T_s=170 K) to $\approx$ 40 $\mu\Omega$cm (for T_S=300 K). The low-temperature coercive field, obtained from AMR data, also decreases from $\approx$ 500 to $\approx$ 300 Oe as T_s increases. At T=300 K, $H_c \approx$ 100 Oe for all values of T_s. AMR values increase with increasing T_s. We find the room-temperature planar Hall effect ratio of about 15% in the films grown at $T_s \geq$ 250 K.

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