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Spin-Orbit Interaction and Kondo Scattering at the $PrAlO_3/SrTiO_3$ Interface SHIRIN MOZAFFARI, Department of Physics, The University of Texas at Austin, SAMARESH GUCHHAIT, Microelectronics Research Center, The University of Texas at Austin, JOHN MARKERT, Department of Physics, The University of Texas at Austin — We have investigated the effect of oxygen content, in the P_{O_2} range of 6×10^{-6} – 1×10^{-3} torr, on the spin-orbit (SO) interaction at $PrAlO_3/SrTiO_3$ interface. The most-conducting 2-D-like $PrAlO_3$ interfaces were not as conducting as comparable $LaAlO_3$ samples, indicating either a steric or mixed-valent effect. The least-conducting, most oxygenated $PrAlO_3$ interface exhibits hole conductivity, a departure from the typical electron-doped behavior. For 10^{-5} and 10^{-4} torr samples, high-temperature metallic behavior is accompanied by an upturn in resistivity at low temperatures, consistent with Kondo scattering theory; analysis gives a Kondo temperature ∼17 K. The magnetoresistance (MR) for the low P_{O_2}-grown samples was modeled with a positive part due to weak anti-localization (WAL) from a strong SO interaction, and a negative part due to the Kondo effect. The variation of MR suggests a strong SO interaction for the 10^{-5} torr sample with H_{SO} =1.25 T in both field orientations. The WAL effect is smaller for higher P_{O_2}-grown samples, where the high-field MR is dominated by the Kondo effect.

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