

Nanostructured surfaces Scattering of surface state carriers on Cr impurities adsorbed on Bi(111) epitaxial nanofilms

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We tested the role of Cr impurities on the strongly spin-polarized surface states of ultra-thin epitaxially grown Bi(111) films by measuring surface magneto-conductance and Hall effect in conjunction with low-energy electron diffraction at low temperature (10K) [1]. Compared with Fe and Co, investigated earlier [2], Cr atoms turned out to have scattering cross sections that are about a factor of three higher than the former atoms. Nevertheless, only small electron donation (0.03 e/atom) was found for Cr. It also exhibits strong spin-orbit scattering, as judged from quantitative analysis of weak localization effects. As a result, all spin-dependent selection rules are gradually relaxed with increasing Cr concentration, so that the initially observed weak anti-localization shifts towards weak localization. Both the nonmonotonic decrease of electrical conductance as a function of Cr concentration and relaxation of magnetoconductance at a constant Cr coverage even at 10K indicate high diffusivity and activated adsorption into its final optimal adsorption site like it was recently found for Tb atoms adsorbed on Bi(111) epitaxial films [3].

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