Journal of Physics Condensed Matter 2004 vol.16 N41, pages L443-L449

High curie-temperature ferromagnetism in cobalt-implanted single-crystalline rutile

Khaibullin R., Tagirov L., Rameev B., Ibragimov S., Yildiz F., Aktaş B.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The ion implantation technique has been used to fabricate a Co-rich layer in rutile: single-crystalline TiO2 substrates were heavily irradiated by Co+ ions with energy of 40 keV. The magnetic properties of as-prepared and post-annealed samples were studied by both inductive and Faraday magnetometry as well as ferromagnetic resonance (FMR). A ferromagnetic Curie temperature as high as 700 K was measured in our samples. The analysis of the magnetic hysteresis loop, the temperature dependence of the saturation magnetization, and strong out-of-plane anisotropy of the FMR spectra allow us to suppose that the origin of the macroscopic high-temperature ferromagnetism is the exchange interaction mediated by oxygen vacancies.

http://dx.doi.org/10.1088/0953-8984/16/41/L03