# Supplementary Material to the article

# "Anomalous behavior of tunneling magnetoresistance in nanocomposite film structures $(CoFeB)_x(LiNbO_3)_{100-x}/Si$ below percolation threshold: Manifestations of co-tunneling and exchange effects"

**A. Electron microscopy.** The microstructure of $(CoFeB)_x(LiNbO_3)_{100-x}/Si$ samples was analyzed using a scanning/transmission electron microscope (STEM/TEM) "Tecnai Osiris" (Thermo Fisher Scientific, USA) operating at 200 kV equipped with high-angle annular dark-field detector (HAADF).

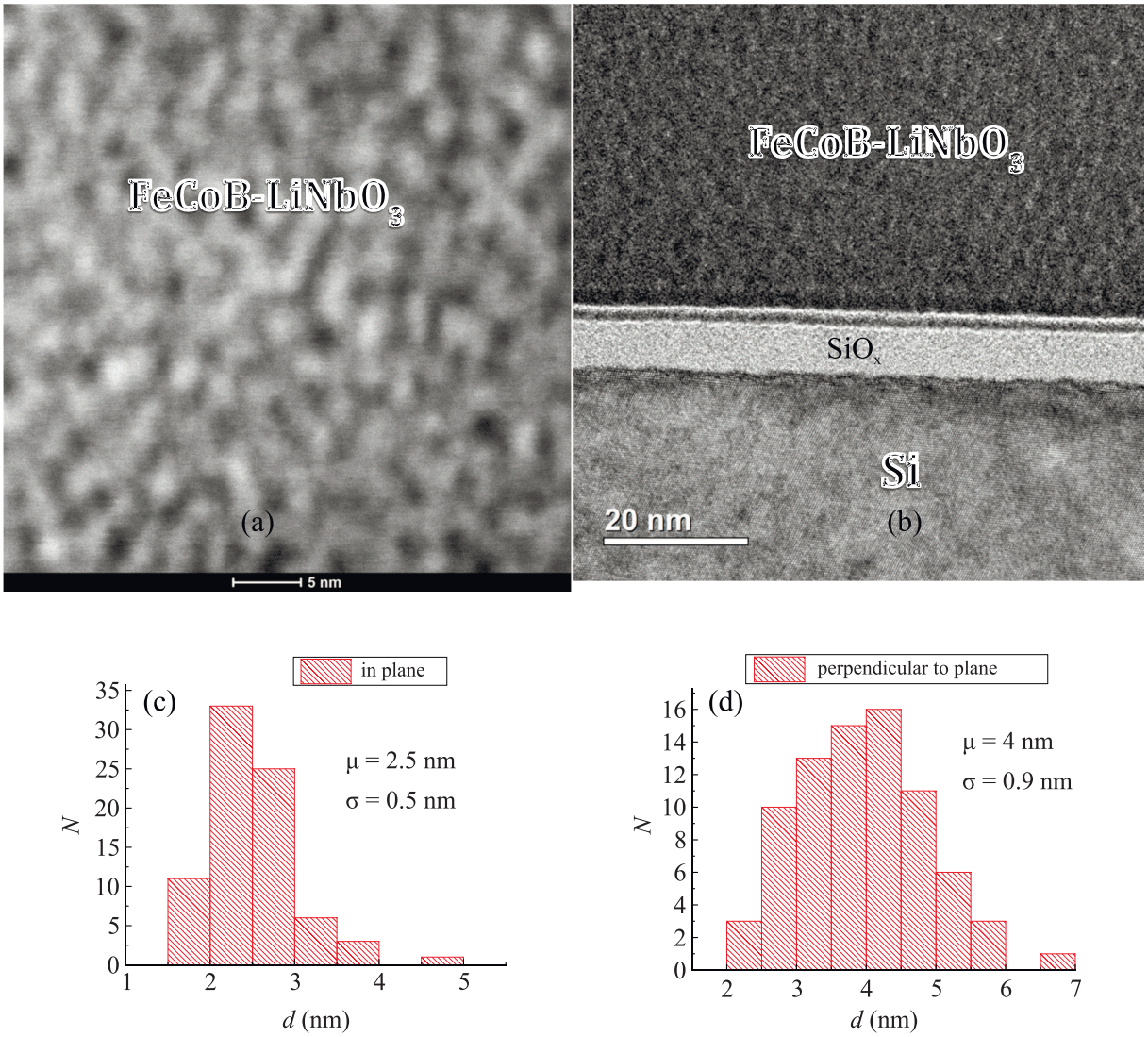


Fig. S1. (a) – HAADF STEM image of a nanocomposite (NC) structure $(CoFeB)_x(LiNbO_y)_{100-x}/Si$ with $x \approx 40$ at. %. Bright granules elongated in the film growth direction are clearly visible. The ratio of the granule size perpendicular to the film to the size along the film $d_\perp/d_\parallel \approx 1.5$. (b) – Bright-field high-resolution STEM (HRSTEM) image of the NC film near the interface with the Si substrate. According to the HRSTEM data, an interface amorphous $SiO_x$ layer with a thickness of 10 nm is observed. Size distribution of granules along (c) and perpendicular (d) to the NC film

**B. ZFC and FC experiments.** Determination of the blocking temperature of $T_b$ granules from measurements of the magnetic moment of samples when they are heated in a weak field of 10 mT after cooling in a zero field (ZFC) and a field of finite value (FC, 10 mT and 1 T).

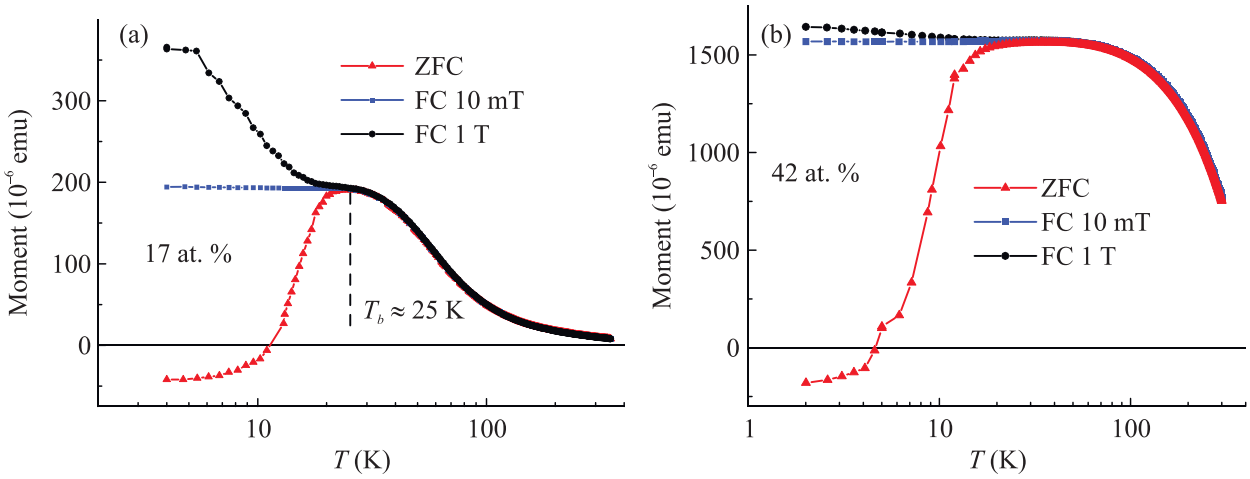


Fig. S2. The dependences of the magnetic moment $J_m(T)$ versus the temperature for NC films $(\mathrm{CoFeB})_x(\mathrm{LiNbO}_y)$ with $x = 17$ at. % (a) and 42 at. % (b), measured at heating in the low applied magnetic field of 10 mT after the zero-field cooling (ZFC curves), as well as to compare the dependence of $J_m(T)$ at 10 mT obtained after cooling the samples in the field of 10 mT and 1 T (FC curves)