

Laser irradiation-induced changes in chemical state and structure of Pt/Co/Pt thin film observed by photoemission electron microscope

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Manipulation of magnetic anisotropy of thin films has been extensively studied in these decades. It was reported that Pt/Co/Pt films exhibit a spin reorientation transition (SRT) from in-plane to perpendicular directions by the irradiation of a femtosecond laser pulse in air [1]. In the present contribution, the origin of the SRT is investigated by means of total-electron-yield Co L- and K-edge XAFS microscopy taken with a photoelectron emission microscope (PEEM). It is revealed that Co is oxidized by the laser irradiation, and that the degree of the oxidation depends on the distance from the center of the laser spot, *i.e.*, the laser power density. In fact, the contribution of Co-O bond increases from the outside to the center of the laser spot, as shown in Fig. 1. Moreover, Co K-edge EXAFS analysis shows that the Co-Co distance significantly increases when Co is only partially oxidized, which coincides with the appearance of perpendicular magnetization. Detailed analyses for the laser irradiation-induced changes in the chemical state and the structure will be presented, and possible origin for the SRT will be discussed.

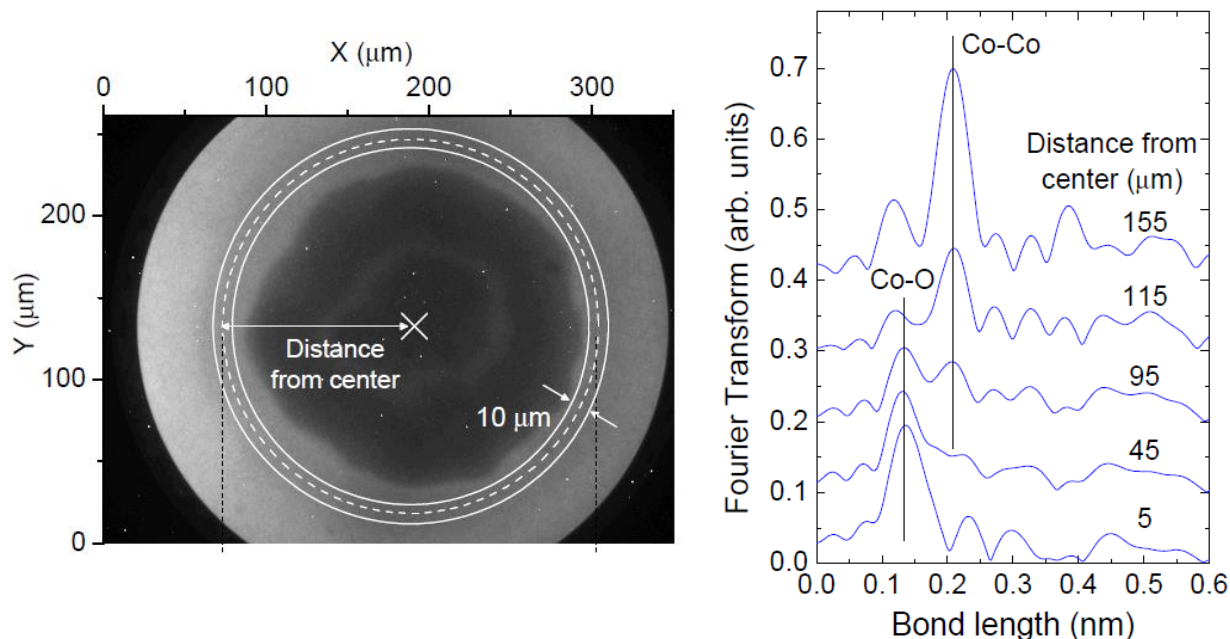


Fig. 1. PEEM image recorded at Co K edge (left) and Fourier transform of Co K-edge EXAFS (right) taken at different distances from the center of the laser spot.

[1] J. Kisielewski et al., J. Appl. Phys. 115, 053906 (2014).