XAS and XMCD studies of Ga\textsuperscript{+} irradiation induced changes of Pt/Co/Pt nanostructure magnetic properties

P. Mazalski\textsuperscript{a}, A. Maziewski\textsuperscript{a}, M. O. Liedke\textsuperscript{b}, J. Fassbender\textsuperscript{b}, J. McCord\textsuperscript{b}, A. Wawro\textsuperscript{c}, A. Rogalev\textsuperscript{d}, F. Wilhelm\textsuperscript{d}

\textsuperscript{a} Faculty of Physics, University of Bia\l{}ystok, Lipowa 41, 15-424 Bia\l{}ystok, Poland
\textsuperscript{b} Helmholtz-Zentrum Dresden-Rossendorf, 01328 Dresden, Germany
\textsuperscript{c} Institute of Physics, Polish Academy of Sciences, 02-668 Warszawa, Poland
\textsuperscript{d} European Synchrotron Radiation Facility (ESRF), BP 220, 38043 Grenoble Cedex, France

In our recent paper [J. Jaworowicz et al., APL95 (2009)] we have demonstrated an elegant route to tune the magnetic anisotropy of ultrathin sputter deposited Pt/Co(d=2.6 nm)/Pt films by uniform Ga\textsuperscript{+} ions irradiation at 30 keV. We have observed that with increasing irradiation dose the magnetization rotates from the in-plane into out-of-plane orientation and for a higher dose back into the plane. For the purpose of the present work we prepared Al\textsubscript{2}O\textsubscript{3}/Mo/Pt/Co(d=3.3 nm)/Pt samples by molecular beam epitaxy with initial in-plane magnetization. These samples were homogeneously irradiated with Ga\textsuperscript{+} ions with an ions dose ranging between 1*10\textsuperscript{14} and 1*10\textsuperscript{16} ions/cm\textsuperscript{2}. The irradiated samples were studied using classical magnetooptical Kerr effect, as well as Co K-edge X-ray absorption (XAS) and X-ray Magnetic Circular Dichroism (XMCD) spectroscopy techniques. From the XMCD spectra analysis [Y.S. Lee et al., PRB68 (2008); J. Bartolom et al, PRB77 (2008)] one can deduce the existence of an ordered Li\textsubscript{0} CoPt phase for the sample, where Ga\textsuperscript{+} irradiation has induced a preferential out-of-plane magnetization.

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Corresponding author: P. Mazalski

Address for correspondence: Faculty of Physics, University of Bia\l{}ystok, Lipowa 41, 15-950 Bia\l{}ystok, Poland

Email address: piotrmaz@uwb.edu.pl