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Competing effect of ferromagnetic/antiferromagnetic interfacial couplings in epitaxial Ni/CoO/Fe trilayer grown on vicinal MgO(001) MENGMENG YANG, QIAN LI, Univ of California - Berkeley, ALPHA N'DIAYE, ELKE ARENHOLZ, ANDREAS SCHOLL, ANTHONY YOUNG, Advanced Light Source, Lawrence Berkeley National Laboratory, QIAOYAN DONG, Univ of California - Berkeley, CHANYONG HWANG, Korea Research Institute of Standards and Science, JIA LI, Peking University, ZIQIANG QIU, Univ of California - Berkeley — It is well known that cooling of a ferromagnet (FM)/antiferromagnet (AFM) bilayer trains the AFM spin configuration which in turn affects the FM layer property. Cooling of a FM/AFM/FM trilayer therefore results in a competing effect between the two FM/AFM interfacial couplings. Here we report an experimental study on Ni/CoO/Fe single crystalline trilayer grown epitaxially on a 7 vicinal MgO(001) substrate. Utilizing element-resolved X-ray Magnetic Circular Dichroism (XMCD) and X-ray Magnetic Linear Dichroism (XMLD) measurements, we found that the Ni magnetization is canted towards out-of-plane direction after cooling the Ni/CoO/Fe trilayer from room temperature to 80K to establish the CoO AFM order. This canting disappears in Ni/CoO bilayer, showing that the canting is from the competing effect between the Ni/CoO and CoO/Fe interfacial couplings. Detailed analysis shows that the CoO spins have an out-of-plane component due to the presence of Fe in the Ni/CoO/Fe trilayer. Photoemission Electron Microscopy (PEEM) imaging shows an orthogonal interfacial coupling at both the Ni/CoO and the CoO/Fe interfaces.

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