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Influence of Au and Al capping layers on the magnetic properties of Fe/(Ga,Mn)As bilayers studied by x-ray absorption spectroscopy A.M. ALSMADI, Kuwait University, Y. CHOI, Argonne National Lab., X. LIU, J. K. FURDYNA, Univ. of Notre Dame — Molecular beam epitaxy grown Fe films on (Ga,Mn)As/GaAs(001) substrates and capped with Au or Al thin over layers with different thicknesses were studied using element specific x-ray absorption spectroscopy and x-ray magnetic circular dichroism (XMCD). The x-ray measurements were carried out at the APS of Argonne National Lab. The optimization of thickness of the capping layer is an important issue as it must be thick enough to effectively protect the sample from oxidation. On the other hand, it must also give acceptably low signal attenuation in the capping layer especially for the XMCD measurements. For Au thicknesses up to 1.71 nm, we observed an antiferromagnetic Fe-oxide layer at the Fe/Au interface. On the other hand, Al thickness of 1.23 nm was enough to effectively protect the sample from oxidation in the air. The presence of antiferromagnetic FeO layer at the Fe/Au interface results in observing exchange bias (EB) phenomena in the Au/Fe/(Ga,Mn)As/GaAs. The presence of this EB helps us to study the coupling between Fe and (Ga,Mn)As layers and also to identify the physical properties of the interfacial layer at the Fe/(Ga,Mn)As interface. We observed an induced magnetic order in the (Ga,Mn)As layer at room temperature, which is ferromagenically coupled with the Fe layer.

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