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Room temperature ferromagnetism of Cr-doped In_2O_3 bi-layer consisted of a triangular crystal-amorphous interface DAI-JHEN JHONG, BO-YU CHEN, CHUN-YU HSU, YAUN-CHAO LIANG, HSIUNG CHOU[1], Department of Physics, NSYSU, Kaohsiung 804, Taiwan — In_2O_3 film is a very conductive and can be modified to exhibit room temperature ferromagnetism upon doping of Cr. In this study, we developed a method, based on the RF power, to control the Cr-doped In_2O_3 (CIO) thin-films to form a crystalline phase, at a high power region, or an amorphous phase, at a low power region. When the RF power is set at a medium power, the CIO film self-assemble into a two layers system consisted of crystalline and amorphous layers with interface manifests zig-zag feature. The two layer system has a saturation magnetization M_s, of ˜0.27 to ˜1.78 emu/c.c. with increase of Cr-doping content. In contrast, the M_s of the amorphous films are ˜0.45 emu/c.c independent of Cr content. Electron energy loss spectroscopy (EELS) measurements suggested that Cr existed in mixed oxidation states in all films. The Cr with lower oxidation state prefers crystalline structure, while the higher oxidation state Cr prefers an amorphous structure. Due to this charge imbalance, a transport of charge across the interface originates the ferromagnetic interaction, and hence, we observe enhanced M_S in crystal-amorphous interface system.

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