Electrical and magnetic properties of Fe_3O_4 films on highly crystalline Cu(111) islands

Ji Woong Kim*, Dooyong Lee, Sehwan Song, Yunhee Cho and Sungkyun Park†
Department of Physics, Pusan National University, Busan 46241, Korea
†psk@pusan.ac.kr

Physical properties of interface between transition metal and ferrimagnets had been long interests in various applications such as spintronics, magnetic tunnel junction, magnetic recording media. In this work, the epitaxial Fe_3O_4 film, one of ferromagnetic oxides was synthesized using sputtering methods on Al_2O_3(0001) substrates. Varying the population density of metallic Cu(111) islands on the substrate, the magnetic and electrical properties of (111) oriented Fe_3O_4 films were examined. With (111) oriented Cu island, the increased carrier concentration and electrical conductivity were observed. However, the saturation magnetization was decreased owing to the presence of intermixing between Cu and Fe_3O_4. The detailed interfacial chemistry and island density depended physical properties will be discussed.

This work was supported by NRF-Korea (NRF-2015R1D1A1A01058672) and KAERI. J.W. Kim also supported by NRF-GPF program (2015H1A2A1034200).