Abstract

In this experiment, the (001) IrMn/CoFe epitaxial bilayers were fabricated on Si substrates at room temperature by using Cu underlayers. A double shifted loop was observed at the axis perpendicular to the exchange bias direction. The dependence of anisotropy on the IrMn thickness was studied. The magnetization reversal was investigated by using vector coil measurements and calculations based on Stoner-Wohlfarth model. A combination of reversible and irreversible rotation was observed for the magnetization reversal along the hard axis. Critical angles and fields at which irreversible rotation occurred were obtained through simulations. When the hysteresis loops measured along other angles (θ) away from the exchange bias direction, the asymmetric magnetization reversal was observed by comparing with the simulated loops at the corresponding same angles. In addition, an unusual time dependent effect was observed in (001) IrMn/CoFe system for the drastically changes of the magnetic properties. Finally, for the further application in magnetic tunneling junction (MTJ), we have successfully deposited the MgO (001) structure by using the (001) IrMn/CoFe underlayers.