Transition of Magnetic Properties with Various Annealing Temperature in CoFeB Films

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CoFeB film is one of the candidates for the next-generation nonvolatile random access memory because of its small Gilbert damping. The Gilbert damping constant α is related to the critical current density and the domain wall speed by the spin transfer torque. The CoFeB film has been therefore extensively examined for the potential application for the STT-MRAM [1] and the domain wall device [2]. The magnetic properties of CoFeB films are known to change with respect to the annealing temperature [3]. In this report, we report an experimental observation of the annealing temperature dependence of magnetic properties. For this study, ferromagnetic CoFeB films with various capping/seed layer are prepared on GaAs(100) substrate by dc magnetron sputtering. After deposition process, a series of the films is annealed with different temperatures from 200°C to 400°C in high vacuum condition (< $3.0\diamond10^{8}$ torr). The change of the magnetic and structural properties is examined by use of a vibrating sample magnetometer (VSM) as well as an x-ray diffractometry (XRD), as summarized by Figs. 1 and 2, respectively. The magnetization precession is then observed by use of a time-resolved magneto-optical Kerr effect measurement to examine Gilbert damping constant. For this measurement, the pump beam is focused onto a spot with a diameter 1 ❍m and magnetic field of 2.5 kOe is applied at an angle 10° from the sample normal. The correlation with the magnetic and structural properties will be discussed.

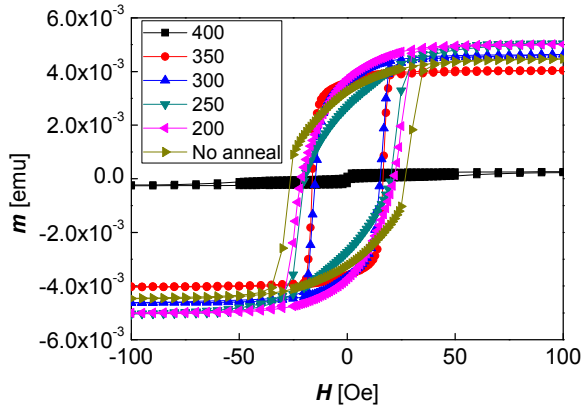

Fig. 1. The hysteresis loop using vibrating sample magnetomer(VSM)

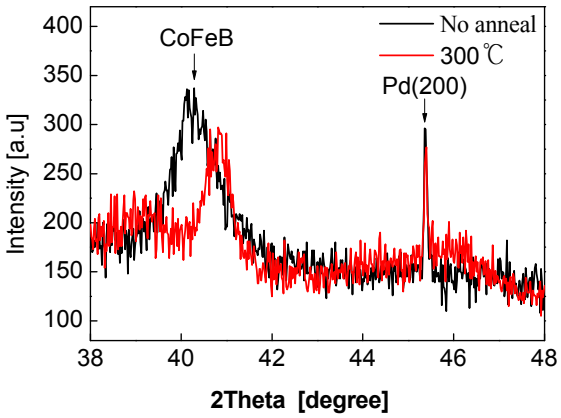

Fig. 2. The intensity of X ray diffraction pattern of Pd/Co72Fe8B20/Pd

참고문헌

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