Microscopic understanding of thermal annealing effect on the perpendicular magnetic anisotropy of Fe/MgO system

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Fe(CoB)/oxide interfaces have been intensively investigated [1-3] because they exhibit large perpendicular magnetic anisotropy (PMA) and a significant tunneling magnetoresistance. In several previous studies, thermal annealing was employed to enhance PMA energy [3]; however, it is not evident how this process modulates the interfacial structure or how the changes in PMA energy arise. In this study, we have focused on the role of internal stress on PMA, and studied a fully epitaxial V/Fe/MgO multilayer with varying epitaxial strain in the V layer.

The schematic of the sample structure is illustrated in Fig. 1(a). Figure 1(b) shows the typical magnetization curves of the as-deposited and annealed samples using the polar magneto-optical Kerr effect (MOKE). The magnetic field strength required to saturate the magnetization decreases after thermal annealing, indicating the enhancement of PMA. The influence of epitaxial strain on the PMA energy in the system will be discussed in the presentation.

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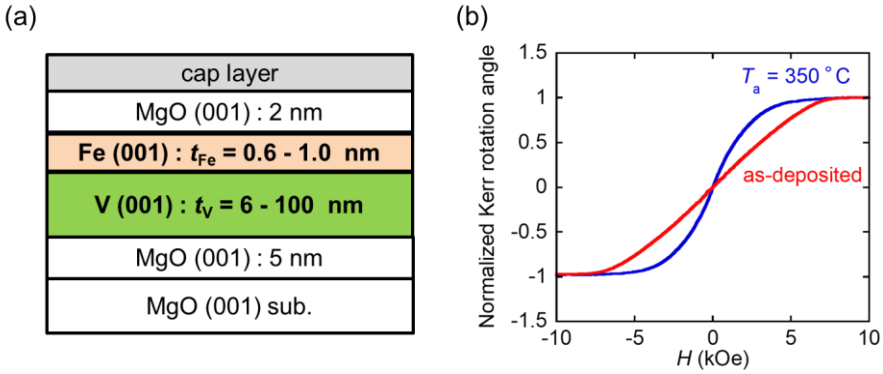

Fig. 1. (a) Schematic of the sample structure. (b) Polar MOKE signals of the as-deposited and annealed samples with V and Fe layer thicknesses of 100 and 0.72 nm, respectively.

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