INFLUENCE OF ANNEALING ON CRYSTALLIZATION AND MAGNETIC PROPERTIES OF SPIN VALVE MgO BASED TUNNEL MAGNETORESISTANCE JUNCTIONS

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9.7 cm

Exchange bias spin valves (EB - SV) with different thicknesses t of the amorphous $(Co_{52}Fe_{48})_{75}B_{25}$ electrodes: glass/Ta5/Ru18/Ta3/$Pt_{46}Mn_{54}$20/$Co_{82}Fe_{18}$20/Ru0.9/ $(Co_{52}Fe_{48})_{75}B_2$5(t)/MgO1.35/$(Co_{52}Fe_{48})_{75}B_{25}$($t$)/Ru5/Ta5 ($t$ = 3,7,15 nm) were prepared by sputtering deposition and annealed from 340 °C to 375 °C. X-ray diffraction analysis (XRD), vibration sample magnetometer (VSM), magneto-optical Kerr effect (MOKE) hysteresis and domain structure imaging were performed. XRD showed that CoFeB electrodes are amorphous in as-deposited state and crystallize to bcc(200) CoFe phase after annealing. The bottom CoFeB electrode deposited on thin Ru exhibited weaker crystallization than the top electrode on (100) oriented MgO. MOKE and VSM measurements showed that annealing above phase transition temperature led to increase of coercivity of the top CoFeB due to higher anisotropy of crystalline CoFe than amorphous CoFeB. This correlates with domain imaging: for as-deposited samples large domains were observed, after annealing their size significantly decreased. Tunneling magnetoresitance of the samples with $t = 3$ nm increased with temperature and reached 138 %. This work was supported by the EU MRTN-CT-2006-035327 SPINSWITCH.

13.4 cm

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