Nanocomposites and nanomaterials

Magnetic and resonance properties of Fe/Cr/Fe asymmetric synthetic antiferromagnets

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Interlayer coupling between ferromagnetic layers separated by nonmagnetic spacers is one of the key factors for many peculiar properties observed in magnetic/ nonmagnetic artificial structures [1]. For example, the static Ruderman-Kittel-Kasuya-Yosida (RKKY) interlayer exchange between ferromagnetic layers results in the giant magnetoresistance phenomenon. The dynamic coupling, mediated by nonequilibrium spin currents, strongly affects the effective magnetization damping [2]. To date, however, there has been a lack of complete understanding of interrelationship between these phenomena.

Synthetic antiferromagnets (SAF), in which magnetizations in neighboring ferromagnetic layers are coupled antiparallelly, are good objects for solving the above task. In this work, SAF nanostructures Si/Fe(6 nm)/Cr(t_{Cr})/Fe(2 nm)/Cu(5 nm) with different thicknesses of Cr spacer (t_{Cr} = (1.3 – 4) nm) were fabricated and investigated. Static magnetic measurements demonstrated that the increase in t_{Cr} results in the weakening of the static antiferromagnetic coupling between ferromagnetic layers. The dynamic characterization of the Fe/Cr/Fe SAFs, studied by ferromagnetic resonance techniques, revealed strong effect of the magnitude and sign of the static exchange coupling constant on the resonance conditions and magnetization damping.

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2. *Avilés-Félix, L., Butera, A., Gómez, J. E.* Spin pumping and inverse spin Hall effect in antiferromagnetic exchange coupled [Co/Ru/Co]/Pt heterostructures // Applied Physics Letters.- 2017. - **110**, N 5. - P. 052402 (1-4).