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Temperature Dependence of Magnetic Properties of a Ultrathin Yttrium-Iron Garnet Film Grown by Liquid Phase Epitaxy: Effect of a Pt Overlayer

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Abstract

© 2018 IEEE. Liquid phase epitaxy of an 18 nm thick yttrium-iron garnet (YIG) film is achieved. Its magnetic properties are investigated in the 100-400 K temperature range, as well as the influence of a 3 nm thick Pt overlayer on them. The saturation magnetization and the magnetocrystalline cubic anisotropy of the bare YIG film behave similarly to bulk YIG. A damping parameter of only a few 10-4 is measured, together with a low inhomogeneous contribution to the ferromagnetic resonance linewidth. The magnetic relaxation increases upon decreasing temperature, which can be partly ascribed to impurity relaxation mechanisms. While it does not change its cubic anisotropy, the Pt capping strongly affects the uniaxial perpendicular anisotropy of the YIG film, in particular at low temperatures. The interfacial coupling in the YIG/Pt heterostructure is also revealed by an increase of the linewidth, which substantially grows by lowering the temperature.

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Keywords

magnetic films, magnetic oxides, magnetization dynamics, Microwave magnetics, microwave materials, spin currents

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