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Session Y38: Spin Pumping and Spin Resonance
11:30 AM–1:42 PM, Friday, March 19, 2021

Sponsoring Units: GMAG DMP FIAP
Chair: Ran Cheng, University of California, Riverside

Abstract: Y38.00007 : Influence of Structural Disorder on Magnetic Relaxation in Fe Thin Films

12:42 PM–12:54 PM Live

← Abstract →

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How magnetic relaxation is impacted by the structural properties of thin films is an important open question, especially for practical applications (e.g. spin-torque memories). In this work, we examine magnetic relaxation in polycrystalline and amorphous Fe films grown on different seed layers. Out-of-plane ferromagnetic resonance (FMR) measurements reveal Gilbert damping parameters of ~0.0025 for both polycrystalline and amorphous Fe films thicker than 6 nm. This damping parameter range is in quantitative agreement with that for epitaxial Fe [1], demonstrating that the intrinsic Gilbert damping of Fe is remarkably insensitive to the film structure. The in-plane FMR linewidths of both polycrystalline and amorphous Fe films exhibit distinct nonlinear frequency dependences, which are quantitatively reproduced by a grain-to-grain two-magnon scattering model [2]. However, the effective damping parameters derived from this model differ by up to
a factor of ~3 from the intrinsic damping parameters derived from out-of-plane FMR. This finding points to the need to consider additional possible contributions to magnetic relaxation in disordered ferromagnetic metal thin films.
[1] Khodadadi et al., Phys. Rev. Lett. 124, 957201 (2020)
[2] Kalarickal et al., Phys. Rev. B 77, 054427 (2008)