Unidirectional damping in exchange biased films

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We report on investigations of the magnetization relaxation in thin NiFe films in close proximity or direct contact with FeMn. We use broadband and angle dependent ferromagnetic resonance experiments to determine the different relaxation contributions and their symmetry. Spin-pumping [1] leads to a significant contribution to the magnetization relaxation in unbiased NiFe films, both for films that were deposited directly on top of the antiferromagnetic FeMn and those separated by a thin Cu spacer. For those structures FeMn acts as a very efficient spin sink [2]. However, we observe an additional increase in the magnetization relaxation for biased NiFe films. Angular dependent measurements reveal the unidirectional character of this additional contribution to the magnetization relaxation, with a maximum in the effective damping when the magnetization is oriented antiparallel to the bias direction and a minimum in the parallel orientation. We observe ferromagnetic thickness dependence of this contribution consistent with two-magnon scattering mediated by imperfections at the interface. Furthermore measurements on NiFe films biased by FeMn with different thicknesses show that the unidirectional damping contribution is directly linked to the exchange bias field in those films.

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