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A grate field-dependent change of magnetic damping in Fe/(Ga,Mn)As SATOI KOBAYASHI, KEITA SUDA, HIRO MUNEKATA, Tokyo Institute of Technology — Reported here is the field dependence of the magnetic damping in the photo-induced precession of magnetization in three different samples, a simple (Ga,Mn)As, two hybrids Pt/(Ga,Mn)As and Fe/(Ga,Mn)As. The Mn content $x$is $x = 0.045$ for all cases. In (Ga,Mn)As, the precession frequency ω increases and the precession lifetime τ decreases with increasing a lateral, external field applied along the easy axis, whereas the $\omega\tau$ product is hardly changed. Similar trend is observed in Pt/(Ga,Mn)As, except that the $\omega\tau$ product is smaller than that of (Ga,Mn)As. An inverse value of the $\omega\tau$ product, so called the Gilbert damping constant α, is $\alpha = 0.1$ and 0.15, respectively, for (Ga,Mn)As and Pt/(Ga,Mn)As. The enhanced magnetic damping in Pt/(Ga,Mn)As can be understood qualitatively in terms of the spin pumping. In Fe/(Ga,Mn)As, the $\omega\tau$ product around the zero field is even smaller than that of Pt/(Ga,Mn)As, being indicative of a larger damping ($\alpha \sim 0.26$), whereas the $\omega\tau$ product increases steeply with an external field. At around 400 Oe and higher, the $\omega\tau$ product saturates at the value comparable to that of a simple (Ga,Mn)As. Taking magnetization data into account, a great field-dependent change in damping could be attributed to the spin-wave excitation at the Fe/(Ga,Mn)As interface caused by non-parallel magnetization configuration between Fe and (Ga,Mn)As in microscopic scale.

Hiro Munekata
Tokyo Institute of Technology

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