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Spin pumping and inverse spin Hall effect in germanium[1] JUAN-CARLOS ROJAS SANCHEZ, UMP CNRS-Thales, C. VERGNAUD, L. VILA, J-P ATTANE, A. MARTY, INAC/SP2M, CEA-UJF, HENRI JAFFRES, UMP CNRS-Thales, MATTHIEU JAMET, INAC/SP2M, CEA-UJF, Grenoble F38054, France, JEAN-MARIE GEORGE, UMP CNRS-Thalès, CNRS Palaiseau F91767, France —
We have measured the inverse spin Hall effect (ISHE) in n-Ge at room temperature. The spin current in germanium was generated by spin pumping from a CoFeB/MgO magnetic tunnel junction in order to prevent the impedance mismatch issue. A clear electromotive force was measured in Ge at the ferromagnetic resonance of CFB. The same study was then carried out on several test samples, in particular, we have investigated the influence of the MgO tunnel barrier and sample annealing on the ISHE signal. The reference CFB/MgO bilayer grown on SiO_2 exhibits a clear electromotive force due to anisotropic magnetoresistance and anomalous Hall effect, which is dominated by an asymmetric contribution with respect to the resonance field. We also found that the MgO tunnel barrier is essential to observe ISHE in Ge and that sample annealing systematically leads to an increase of the signal. We propose a theoretical model based on the presence of localized states at the interface to account for these observations. Finally, all of our results are fully consistent with the observation of ISHE in heavily doped n-Ge with a spin Hall angle around 0.001.

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