Voltage generation by ferromagnetic resonance in Fe/Co bilayer with perpendicular magnetic anisotropy

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Magnetoelectric effects, such as the induction of currents or voltages by magnetization dynamics, are key to enabling efficient interconversion between magnetic and electric signals. These mechanisms play an important role in the development of low-power spintronic devices and novel sensing platforms. Understanding and optimizing such coupling is essential for advancing next-generation functional materials and nanoscale technologies. In this work, we have performed detailed numerical simulations of the ac and dc voltages generated in an MgO/Fe/Al/Co/Au structure due to spin pumping and spin-dependent conductivity in ferromagnets. The study considered the effects of external magnetic fields, the thickness of the Al spacer and Fe layer to determine the generated voltage signal. We also studied the direction, frequency, and amplitude of microwave excitation in presence of other dielectric spacer layer in the stack. Our calculations indicate that replacing the aluminum spacer with a low-electronic-conductivity material, such as semiconducting silicon, leads to a significant enhancement of the voltages generated by magnetization precession. To experimentally observe the voltage signal, we have deposited the stack using magnetron sputtering, which will be further patterned by optical lithography to perform magnetoelectric measurements.

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