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Spin-Hall effect in bulk germanium MATTHIEU JAMET, Universite Grenoble Alpes, INAC-SPINTEC , FEDERICO BOTTEGONI, CARLO ZUCCHETTI, STEFANO DAL CONTE, JACOPO FRIGERIO, ETTORE CARPENE, Politecnico di Milano, CELINE VERGNAUD, Universite Grenoble Alpes, INAC-SPINTEC , GIOVANNI ISELLA, MARCO FINAZZI, GIULIO CERULLO, FRANCO CICCACCI, Politecnico di Milano — Germanium is one of the most appealing candidate for spintronic applications, thanks to its compatibility with the Si platform, the long electron spin lifetime and the optical properties matching the conventional telecommunication window. Electrical spin injection schemes have always been exploited to generate spin accumulations and pure spin currents in bulk Ge. However, it is well known that ferromagnetic injection or detection blocks can introduce parasitic effects at the metal/semiconductor interface, which are still under debate. Here, we exploit the spin-Hall effect to generate a uniform pure spin current in an epitaxial n-doped Ge channel and we detect the electrically-induced spin accumulation, transverse to the injected charge current density, with polar magneto-optical Kerr microscopy at low temperature. We show that a giant spin density up to 200 m^{-3} can be achieved at the edges of the Ge channel for a low-voltage applied bias. Such a giant spin density is almost two orders of magnitude larger than the one achievable in III-V semiconductors. We have also characterized the electrically-induced spin voltage as a function of the applied bias and temperature, revealing that the spin-to-charge conversion in bulk Ge is preserved up to 120 K.

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