Development of large-area topological insulators on Silicon for spintronics

Roberto MANTOVAN – *CNR-IMM*

Topological insulators (TIs) are gaining a huge attention from a technological point of view due to highly efficient spin-charge interconversion phenomena occurring at their interface with magnetic materials, which is of interest for spin-orbit torque MRAM and novel processing-in-memory devices such as the MESO proposed by Intel. We developed Metal Organic Chemical Vapour Deposition (MOCVD) processes to grow epitaxial-quality Sb_2Te_3 and Bi_2Te_3 3D-TIs on 4" Si(111) substrates. Following the validation of their topological character, we built simple spin-charge converters by interfacing the TIs with ferromagnetic layers (FM=Fe,Co). Within this talk I report a large spin-charge conversion efficiency in the FM/Sb_2Te_3-based systems, as expressed in terms of the generated inverse Edelstein Effect (l_{IEE}) extracted from spin pumping ferromagnetic resonance (SP-FMR). Values of l_{IEE} up to 0.61 nm are measured, being record values for the second generation of 3D chalcogenide-based TIs. Our results open interesting routes toward the use of chemical methods to produce TIs over large area Si substrates and characterized by highly performing S2C conversion, thus marking a milestone toward future technology-transfer.