Conversion Between Spin and Charge Currents by Rashba or Topological Insulator Interfaces and Perspectivefor Low Power Spintronic Devices

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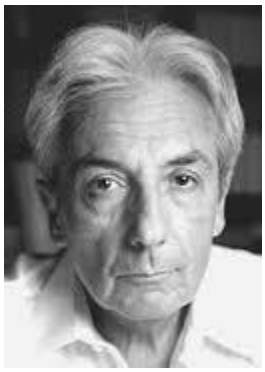
Spintronics is based on the conversion between charge and spin currents. It was achieved by using exchange interactions in classical spintronics (GMR, TMR, STT) and it has been more recently done by exploiting spin-orbit couplings (SOC), for example by using the Spin Hall Effect in SOT-MRAMs. Rashba interfaces and Topological Insulators open a new for conversion by SOC. For applications efficient conversion at room temperature is a prerequisite.

I will present experimental results of conversion at room temperature obtained in spin pumping experiments with i) Bi/Ag Rashba interfaces and ii) thin films of the recently discovered TI α-Sn. I will show how the very efficient conversion by α-Sn can be quantitatively related to ARPES characterizations on the same samples and I will describe the general perspective for the exploitation of TI in low power spintronic devices. Finally I will also present promising preliminary results with other TI and LAO/STO interfaces.



BIO: Albert Fert graduated from École Normale Supérieure in Paris, earned his Ph.D. at University of Paris in 1970 and became Professor of Physics at University Paris-Sud in 1976. He is Scientific Director of a joint laboratory of CNRS and company Thales, Emeritus Professor at University Paris-Sud, and member of the French Academy of Sciences.

The experimental (and theoretical) research of Professor Fert is in condensed matter physics (electronic and magnetic properties of solids, spintronics). He was one of the co-discoverers of Giant Magnetoresistance in 1988, a phenomenon which is well known for its application to hard discs and the resulting large increase of their storage capacity.

This discovery has also triggered the development of the important research field which is called spintronics and sometimes defined as a new type of electronics harnessing the spin of the electrons. Professor Fert and his team have made significant contributions to the development of spintronics, in particular by works on the theory of spin transport (Valet-Fert model) and experiments on spin dependent tunneling, generation of microwaves by spin transfer, Spin Hall Effect, and spin transport in carbon nanotubes or graphene.