Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Electrochemical Materials

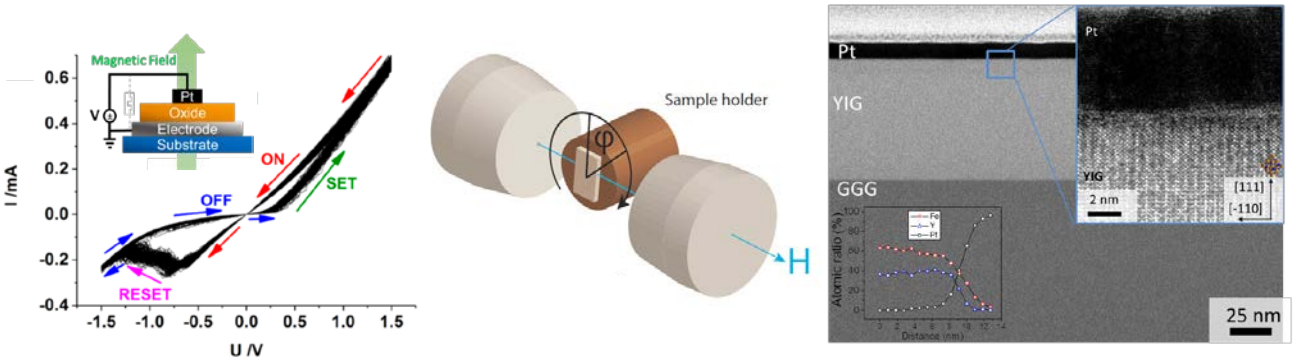
Master Thesis – Material Sciences

Uncovering Magnetic-Field Coupled Resistive Switching in Ferrimagnetic Insulators for Novel Devices

Resistive switches or memristive devices are extensively studied as promising circuit element and memories for future electronics. Highly nonlinear and nonvolatile memristive characteristics of two-terminal capacitor-like metal-insulator-metal (MIM) devices were found in wide range of materials from organic monolayers and polymers till glasses, salts and ceramics. Here, we propose to investigate the material YIG as a novel type of combined resistive-magnetic switch device.

We are welcoming a motivated Master thesis student in an interdisciplinary D-MATL project involving the following groups: *Electrochemical Materials, Magnetism and Interface Physics* and the *Laboratory for Multifunctional Ferroic Materials*. The project comprises the growth of the test materials by pulsed laser deposition (PLD) and microfabrication of device structures in the FIRST-clean-room facilities of ETH Zurich. Electrochemical measurements will be performed under varying magnetic fields to make a step towards a better understanding of the physical processes involved in resistive switching and potentially suggest new device operation principles. Structural (SEM, XRD, AFM, optical microscopy, Raman spectroscopy) characterizations will be performed to support the electrical results.

We look for a creative and fearless student to perform an unusual set of experiments, material synthesis and device design. Creative and analytical thinking will be required for optimizing the processes, and the device architecture based on the first outcomes. The project shall enable a better understanding of the switching mechanism and new device paradigms.



a) Resistive switching observed in a MIM-heterostructure characterized by Current-Voltage (IV) cycling b) Setup geometry for measuring magnetic-field coupled resistive switching c) Transmission electron microscopy analysis of an epitaxial YIG film based heterostructure.

Literature
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