EUROPEAN MATERIALS SCIENCE PROJECT AT THE INSTITUTE OF SOLID STATE PHYSICS, UNIVERSITY OF LATVIA

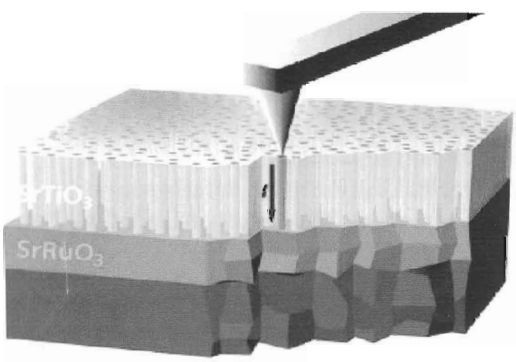
FP6 MATERA – ERA-NET Materials project "Functional materials for resistive switching memories" (FMRSM)
Project period: 01.02.2009–31.01.2012
Project holder: Institute of Solid State Physics, University of Latvia (ISSP UL)
Project contact person: Dr. habil. phys. J. Purans

SEVENTH FRAMEWORK PROGRAMME

EIROPAS SAVIENĪBA

MATERA

The aim of the project is to develop the basic science and technology for new functional ternary oxides for the use as future resistive switching memories at the nanoscale level (20 nm). Since extended defects as dislocations or defect clusters with nanoscale dimensions are considered to be the single resistive switching units in doped ABO_3-perovskites, one has to gain deeper understanding of the complex correlation between defect structure,



elementary and defect distribution and switching properties.

Within the project, we indent to solve this challenging task by bundling the research activities of 3 different leading European groups which have a complementary expertise in the field of perovskite materials. The fabrication of $SrTiO_3$ thin films, doped with different transition metals (Fe, Nb) have been performed by Pulsed Laser Deposition in the Forschungszentrum Jülich. In order to clarify the spatial distribution of doping atoms, thin films as well as single crystals have been analyzed by means of sophisticated spectroscopic techniques, e.g. synchrotron based x-ray absorption spectroscopy (XAS) by the experimental partner at the Institute of Solid State Physics University of Latvia.

This work has been supported by ab initio calculations of the formation energies of defects and cation segregation by the theoreticians in the Institute of Solid State Physics University of Latvia.

For a given defect/cluster configuration, the resistive switching properties have been investigated in the Jülich group by means of the elaborate electrical characterization as well as by conductive-tip atomic force microscopy. In order to clarify the switching mechanisms, these investigations have be supported by scanning tunnelling microscopy (STM) with atomic resolution as well as by x-ray photoelectron spectroscopy (XPS) and scanning Auger electron spectroscopy (AES) in the Katowice group.

As a result of intensive research, a microscopic model for resistive switching was develop and a fabrication a thin film device with improved switching performance was proposed. ●