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## ATOMIC-SCALE INVESTIGATION OF MATERIALS FOR SPINTRONICS BY MEANS OF MÖSSBAUER SPECTROSCOPY

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Spin-based electronics (spintronics) is a very rich and exciting field in materials science, where the investigation of fundamental aspects involving spin-related behaviours at the nano-scale merges novel device concepts. The spin polarized currents manipulation in magnetic tunnel junctions and spin injectors is driven by the structure, magnetism, and chemical composition at the interfaces between ferromagnetic (FM) thin films and oxides. The origin of the magnetoelectric coupling at some FM/ferroelectric interfaces is still debated. The magnitude of spin polarization in half metals such as  $\text{Fe}_3\text{O}_4$  can be influenced by films stoichiometry. Among the most exotic topics in spintronics there is the claimed possibility of achieving ferromagnetism in wide gap semiconductors such as  $\text{ZnO}$  by doping them with dilute 3d-elements and/or by “hoping” in spin-polarized defects to

generate ferromagnetic ordering. Mössbauer spectroscopy (MS) is a powerful method that gives structural, chemical, and magnetic information at the most atomic-scale through the hyperfine interactions between the Mössbauer-active nuclei and the nearest and next nearest neighbours, and it is of help in getting more insights into the above mentioned criticisms. In this contribution, the potentiality of  $^{57}\text{Fe}$ -conversion electron MS (CEMS) for investigating the structure and magnetism at the interfaces between Fe thin films and different oxides ( $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{BaTiO}_3$ ,...) will be shown [1-4], together with the correlation between the band alignment of the Fe/ $\text{BaTiO}_3$  and Fe/ $\text{Gd}/\text{Al}_2\text{O}_3$  systems with their interfacial properties [1,4]. The potential influence of  $\text{Fe}_3\text{O}_4$  stoichiometry (measured by CEMS) on its magnetoresistance properties will be discussed [5,6]. Finally, the contribution of on-line MS performed at the large-scale facility of ISOLDE/CERN to the understanding of dilute magnetism in  $\text{ZnO}$  will be presented [7-11].

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