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Epitaxial $CoFe_2O_4$(111)-based multilayers for spin filter applications[1] ANA RAMOS, JEAN-BAPTISTE MOUSSY, MARTINE GAUTIER-SOYER, CEA-Saclay, France — Efficient spin filtering at room temperature has high potential for ultra sensitive detectors and spin injection into semiconductors, leading to the growth of spin-based devices. We investigate the interaction of spin filter $CoFe_2O_4$(111) epitaxial tunnel barriers with Co and Fe_3O_4 electrodes in light of their possible application at room temperature. The question of the exchange coupling that often prohibits the independent switching between a magnetic tunnel barrier and its magnetic electrode is addressed, as is the difference between an oxide/metal and oxide/oxide system. Our study of the magnetic reversal in the $CoFe_2O_4$/Co and $CoFe_2O_4$/Fe_3O_4 bilayers, supported by a detailed structural and chemical analysis of the samples and their interfaces, clearly evidences the effect of a metallic or an oxide interface. An unusual exchange spring magnet behavior arises in the case of the $CoFe_2O_4$/Fe_3O_4 samples due to the superexchange interactions found in these ferrimagnetic oxides. This unique exchange phenomenon at the oxide-oxide interface ultimately leads to a barrier/electrode system that switches independently without the necessity of a non-magnetic spacer.

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