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Influence of disorder on tunnel magnetoresistance V. KARPAN, I. MARUSHCHENKO, A. STARIKOV, University of Twente, Enschede, The Natherlands, P.X. XU, K. XIA, State Key Laboratory for Surface Physics, Beijing, China, M. ZWIERZYCKI, Max-Planck-Institut fur Festkorperforschung,Stuttgart, Germany, P.J. KELLY, University of Twente, Enschede, The Natherlands — In spite of recent success in observing large values of tunnelling magnetoresistance (TMR) in epitaxial FeCo|MgO|FeCo magnetic tunnel junctions (MTJ's), the values reported are still two orders of magnitude lower than those predicted by first-principles transport calculations for ideal, defect-free MTJ's. In this talk, we present results of a systematic study of the influence of roughness and leads disorder on TMR in a FeCo|vacuum|FeCo model system. Our study is based upon a tight-binding muffin-tin orbital (TB-MTO) implementation of the Landauer-Büttiker scattering theoretical formulation of transport. Disorder is included in the transport calculation using large lateral supercells. In our study we found that in case of ideal, perfectly ordered systems, the values of TMR comparable in size to those predicted by others in which the mechanism responsible is the very effective transmission through resonant states close to the Fermi level for the minority spin channel. Roughness is found to quench these resonances leading to a drastic reduction of TMR to values comparable to those seen in experiment. Leads disorder is found to quench the TMR but less strongly than roughness.

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