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Spin-transfer torque in antiferromagnetic and ferrimagnetic tunnel junctions PABLO MERODIO, SPINTEC, ALAN KALITSOV, MINT Center, University of Alabama, HELENE BEA, VINCENT BALTZ, MAIRBEK CHSHIEV, SPINTEC, SPINTEC COLLABORATION, MINT CENTER, UNIVERSITY OF ALABAMA COLLABORATION — Spin Transfer Torque (STT) and Giant-Magnetoresistance in ferromagnets (F) are the two essential underlying phenomena in modern spintronics. These effects have also been predicted to occur in nanostructures comprising only normal and antiferromagnetic materials. Therefore, antiferromagnets (AF) could potentially be used in place of F in future spintronic applications. We present a theoretical study of STT and Tunnelling Magnetoresistance (TMR) in AF and ferrimagnet (FI) based tunnel junctions, where two magnetic metal electrodes with at least one of them being FI or AF are separated by a thin nonmagnetic insulating barrier. We found that electronic structure parameters such as Fermi energy and exchange splitting of the FI and AF leads strongly influence STT and TMR properties including their bias dependence. In particular, STT spatial distribution within the leads shows nontrivial behavior which can be explained in terms of interplay between exchange splittings of the two AF or FI sublattices. Such insights will be of importance for optimizing current induced magnetization reversal phenomena.

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