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Materials Study of the Free and Pinned Structures for Fully Perpendicular Magnetic Tunnel Junctions

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Fully perpendicular tunnel junctions have a clear advantage for non-volatile spin-torque transfer random access memory (STT_RAM). However, such perpendicular MTJ's have been seen to have limited tunneling magnetoresistance (TMR) compared to MgO-based in-plance tunnel junctions. We will present an overview of the science and technology of the fabrication and growth of the free and pinned layers of fully perpendicular MTJ's, including an analysis of what limits the TMR. We will detail exciting new developments in this field that result in much higher TMR of fully perpendicular MTJ's and improved switching times that may make this technology a competitive and viable one for the future. Micromagnetic simulations that closely match the experimental results will be shown.