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Tunnel magnetoresistance in mesoscale (Ga,Mn)As magnetic tunnel junctions. PARTHA MITRA, MARK J. WILSON, MENG ZHU, PETER SCHIFFER, NITIN SAMARTH, Dept. of Physics, Penn State University, University Park PA 16802, KIRAN V. THADANI, DAN C. RALPH, Dept. of Physics, Cornell University, Ithaca NY 14853 — We recently demonstrated exchange-biased magnetic tunnel junctions (MTJs) built from the ferromagnetic semiconductor (Ga,Mn)As [Phys. Rev. B. **78**, 195307 (2008)]. Here, we report measurements of the tunnel magnetoresistance (TMR) in mesoscale (Ga,Mn)As MTJ devices with areas that range from $\sim 1 - 100\mu\text{m}^2$, mapping out the TMR as a function of the magnetic field vector and the sample temperature. The vector field measurements provide insights into the interplay between TMR and the magnetic anisotropies characteristic of (Ga,Mn)As. In contrast to our earlier studies large area devices, we find that the TMR in these mescoscale devices increases exponentially with decreasing temperature, with a form exp (-T/T*). At temperatures lower than T*, the conductance-voltage characteristics show a $\sqrt{V}$ dependence, suggesting the role of Coulomb interactions in the spin- dependent tunneling process in these small area MTJs. Work supported by the ONR MURI program.

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