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Spin orbit torques in W(O) based three terminal magnetic memory devices. JIE ZHANG, TIMOTHY PHUNG, CHIRAG GARG, CHARLES RETTNER, BRIAN. P HUGHES, SEE-HUN YANG, STUART. S.P PARKIN, IBM Almaden Res Ctr — Recently, there has been a large interest in using spin orbit torques to controllably manipulate the magnetic order parameter in several promising magnetic memory devices such as racetrack memory and spin transfer torque MRAM. The efficient operation of such devices necessitates the finding of materials which exhibit efficient conversion of charge currents to spin orbit torques. This is typically quantified by the so-called spin Hall angle. The most efficient spin orbit torque generator to date based on the use of conventional metallic materials is W(O), wherein the effective spin hall angle is found to be -0.5. Here, we explore the use of W(O) to manipulate magnetization in three terminal magnetic memory devices. We find, consistent with the large spin orbit torques, observed in W(O), that the critical current required for switching a magnetic element is significantly smaller than compared to other metallic systems such as Pt, β-W, and Ta. Lastly, we shall discuss the technologically important high speed (˜ns time scale) switching dynamics in these devices and the role of complex micromagnetic states upon the switching process.

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