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**Growth of $\beta$-Tungsten Films Towards a Giant Spin Hall Effect Logic Device** AVYAYA JAYANTHINARASIMHAM, MANASA MEDIKONDA, AKITOMO MATSUBAYASHI, State University of New York, Albany, PRASANNA KHARE, HYUNCHER CHONG, RICHARD MATYI, ALAIN DIEBOLD, VINCENT LABELLA, SUNY, Polytechnic Institute — Spin-orbit coupling in metastable $\beta$-W generates spin transfer torques strong enough to flip magnetic moment of an adjacent magnetic layer. In a MTJ stack these torques can be used to switch between high and low resistive states. This technique can be used in designing efficient magnetic memory and non-volatile spin logic devices. Deposition conditions selective to $\beta$- W need to be understood for the large scale fabrication of such devices. The transition from $\beta$ to $\alpha$ phase of Tungsten is strongly governed by thickness of W layer, base pressure and oxygen availability for example, above 5 nm $\beta$ film relaxes and forms an $\alpha$ phase. Resistivity measurements as well as x-ray photoelectron spectroscopy and x-ray diffraction and reflectivity analysis are performed to determine the phase and thickness of tungsten films. We show that $\beta$ phase is influenced by ultrathin thermal oxide of Si layer and the amount of oxygen flow during the growth. These results demonstrate a reliable technique to fabricate $\beta$ W film up to 20 nm on bare Si and silicon dioxide, while providing insight to growing it anywhere in the device stack.

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