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Thickness Dependence of Electrical Breakdown in h-BN dielectric using C-AFM microscopy AVINASH NAYAK, DONGHYI KOH, DEJI AKINWANDE, UT Austin — For nano-scale graphene transistor applications, hexagonal boron nitride (h-BN) is a highly desirable dielectric material that is being investigated not only because of its intrinsic properties but also because of its low lattice mismatch with hexagonal graphene. Currently, SiO_2 limits the carrier mobility of graphene due to substrate phonon coupling. Therefore, h-BN can be employed for mobility enhancement beyond the values achievable on standard dielectric. Decreasing the device dimensionality however, requires a more detailed understanding of electrical breakdown at the nanoscale. We will present on the intrinsic breakdown electric field (E_{BF}) of h-BN thin films in a metal-insulator-metal (MIM) configuration. This nanoscaled MIM structure is measured using conductive-atomic-force microscopy (C-AFM). Here, C-AFM is used to extract breakdown voltage for various thicknesses of mechanically exfoliated h-BN flakes. We measure the dielectric properties of h-BN flakes that vary from 2nm to 25nm and determine the ultimate scalability of hBN dielectrics.

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