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Transfer-free growth of atomically thin hexagonal boron nitride¹ SUSHANT SONDE, Microelectronics Research Center, University of Texas at Austin, NING LU, MOON KIM, University of Texas at Dallas, LUIGI COLOMBO, Texas Instruments, SANJAY K. BANERJEE, Microelectronics Research Center, University of Texas at Austin — Recent interest in and hence the opportunities presented by two-dimensional materials and their stacked assemblies have necessitated growth of high quality sheets of hexagonal boron nitride (h-BN). Chemical vapor deposition on transition metals is perhaps the most promising technique for largescale growth of single or few-layer h-BN films with relatively controllable means to produce predetermined number of layers. In most of the studies till date, it is not very clear as to why the growth is not self-limiting to a monolayer and how multilayer h-BN is grown. In this study we present growth of high quality h-BN on Nil and Co films deposited on oxidized silicon. h-BN films thus produced show excellent optical ($E_q = 5.85 \text{ eV}$) and electrical insulating properties (breakdown strength = 7.94 MV/cm). We deliberate on the growth mechanism driven by diffusion vs. segregation of B and N, with evidence that the growth occurs via segregation of B and N from the metal films. We discuss solubility of N and B in Ni and Co films. By controlling the growth parameters we show that h-BN segregation can be achieved on both sides of the metal film, thus allowing deposition of such atomic films by a transfer free method on arbitrary substrates.

¹SWAN

Sushant Sonde Microelectronics Research Center, University of Texas at Austin

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