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Effect of surface preparation of copper on spin-coating driven self- assembly of fullerene molecules

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Abstract:

In this work, spin coating driven self-assembly of C_{60} fullerenes on copper based substrates has been investigated. In particular, the substrates investigated include chemically and thermally pre-treated copper, electropolished copper and graphene coated copper. Further, the dependence of spin-coating conditions involving solutions of fullerenes dissolved in toluene is examined. The investigations show that graphene coated copper offers the best ability to obtain rod-like self-assemblies of fullerene. For the graphene coated copper system, the shape of the rods remains independent of the rotation speed, while only the length of the self-assembled rods decrease as a function of rotation speed; however, on the other substrates, there is a transition from larger rod-like self-assembly at lower speeds to smaller agglomerates/islands at higher speeds. The stable formation of fullerene rods on graphene on copper is attributed to the graphene corrugations on copper, which serve as stable nucleation sites, from which the growth of rods occur, promoted by toluene. This ability to control the size of the fullerene rods in a systematic fashion provides new avenues for utilizing the rods as potential interconnects in integrated circuits.

Keywords: Self-assembly; fullerene; graphene; copper; interconnects