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Integration of Nanotubes, Etch Tracks, and Nanoribbons in Crystallographic Alignment MATHIAS J. BOLAND, D. PATRICK HUNLEY, ABHISHEK SUNDRARAJAN, MOHSEN NASSERI, DOUGLAS R. STRACHAN, Univ of Kentucky — Three nanomaterial components, carbon nanotubes (CNTs), few-layer graphene (FLG), and etch tracks exposing insulating SiO_2 regions, are integrated to form crystallographically-aligned nanoscale systems. These integrated systems consist of CNTs grown across nanogap etch tracks and nanoribbons formed within the FLG films as a result of chemical vapor deposition (CVD) processing. Each nanoscale component is aligned along the underlying graphene lattice, resulting in their orientations being locked into precise values, with CNTs maintaining alignment even after crossing etch tracks. The growth of aligned CNTs across nanogap etch tracks and nanoribbons suggests that integrated formations can be achieved by growing CNTs directly over nanogap etch tracks and nanoribbons. This is supported by calculations of the vibrational energy of CNTs indicating that they should be capable of maintaining atomic registry with an underlying graphene lattice as they grow across a typical etch track, in agreement with our experimental results. Thus, this work is relevant to the integration of semiconducting, conducting, and insulating nano-materials all together into precise nano-electronic systems.

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