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From (Single) Molecular Precursors to Thin Films and Nanomaterials, and back to Surfaces

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We have been developing single source precursors for various thin films and employing them in metal organic chemical vapor deposition (MOCVD) with some successful results. These include cubic silicon carbide (3C-SiC), magnesium oxide (MgO), and hexagonal and cubic gallium nitride (*h*-GaN and *c*-GaN). Some of (our) single precursors are useful in preparing nanoparticles and nanoneedles of oxides and nanorods of heterometallic oxides. Recently, new precursors have been synthesized for MOCVD of metals such as Cu, Ni, Pd, etc. Concurrent with the employment of atomic layer deposition (ALD) in semiconductor industries, some MOCVD precursors have been reexamined and found use in the ALD processes, a good example of which is the ALD of Al_2O_3 by using dimethylaluminum isopropoxide (Me_2AlO^iPr). The problem of having an incubation (induction) period in the initial stage of the ALD process of Al_2O_3 has lead us to preparation of hydroxyl-terminated Si(001). The OH-terminated Si(001) has never been investigated and therefore needs serious surface scientific studies. In this talk, the importance of surface and interface preparations will be emphasized based on the experiences of our laboratory.