Materials Research Science and Engineering Centers DMR-1720415

IRG2: Lanthanide Atomic-Layer Deposition: Towards New Oxide Compositions and Geometries

2018 IRG2 Intellectual Merit

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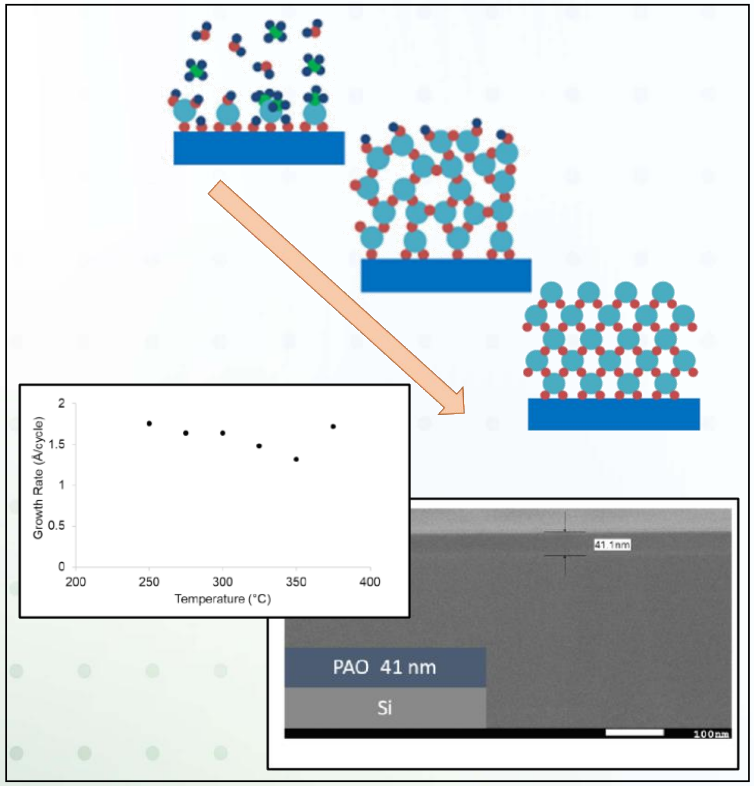
Creating thin films using novel synthesis techniques is a key step in expanding the functionality of metal oxide materials. It is particularly important to create these oxides in new geometrical forms and with new compositions. Researchers at the Wisconsin MRSEC have developed ways to create new oxides by first synthesizing them in the amorphous form and subsequently crystallizing the deposited material, a process known as solid-phase epitaxy (SPE).

The use of SPE to create crystals in intricate 3D geometries depends on the development of atomic-layer deposition (ALD) precursors and deposition methods that expand the range of materials that can be synthesized. Wisconsin MRSEC researchers have focused on ALD studies of lanthanide oxides, which are especially attractive materials because of their broad scope of useful properties. Discoveries in precursor synthesis in these materials can also be rapidly transferred among many elements. The MRSEC team has discovered promising precursors for the element praseodymium, exhibiting a wide range of deposition temperatures compatible with common aluminum precursors and demonstrated the formation of praseodymium aluminum oxide (PAO) thin films.



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