

Complex Oxide Heterostructures and Multiferroics

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Complex transition metal oxides have attracted a lot of attention because of versatile phenomena and rich physics due to a competition between strongly correlated states with different spin, orbital, and charge. Since the discovery of high T_c superconductivity, many efforts to synthesize complex oxide compounds in epitaxial film form have been made. We now know basic rules about experimental techniques and materials design. In the talk, we will introduce laser molecular beam epitaxy (L-MBE) technique for growing oxide thin layers with atomic precision and discuss why such epitaxial growths would bring interesting physics. As an example, we will focus on a highly-elongated bismuth ferrite with a high tetragonal factor ($c/a \sim 1.26$) which is a meta-stable phase competing with the multiferroic bismuth ferrite phase. It is never made in bulk form, but it can be stabilized by hetero-epitaxial growth on special substrates owing to misfit strain. Stabilization of such a meta-stable state gives us another chance to search for new materials. The delicate nature of phase competition and the physical properties of the metastable phase will be presented.