OxMBE - *Oxide molecular beam epitaxy*

The **oxide molecular beam epitaxy (Oxide MBE) laboratory**, led by research scientist Bruce Davidson (INFM-TASC), grows nanostructured films of complex oxides whose unusual properties derive from strong electron-electron/electron-lattice interactions. These materials range from high-temperature superconductors to «colossal magnetoresistive» ferromagnets to ferroelectrics and multiferroics, and devices based on them. A large number of these are based on the cubic perovskite ABO_3 structure incorporating different transition metal cations in the B-site and mono-, di- and trivalent cations on the A-site, and nanostructuring is accomplished by the careful control over atomic layering during deposition that is possible by oxide MBE.

Oxide MBE is an **adaptation of the molecular beam epitaxy technique**, originally developed for the growth of compound and elemental semiconductors, with two principal modifications. The first modification is the creation of an oxidizing ambient; in our case, we have chosen pure ozone produced by a distillation process. The second modification is the inclusion of an in situ noninvasive measurement of atomic fluxes in real-time. This is necessary because first, there is often no self-limiting growth mechanism as exists in e.g. GaAs MBE, and second, the oxide phases often have 4 or 5 constituent atoms (plus oxygen), each of which must arrive at the substrate in precise doses (to within ~1% of a monolayer). In addition to these modifications, there is an in situ **reflection high energy electron diffraction** (RHEED) system that gives surface diffraction information during the deposition of each monolayer.

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