Synthesis of single crystalline multiferroic BiFeO$_3$ films


BiFeO$_3$ is a room temperature multiferroic material widely pursued for various applications. Because of synthesis difficulties, bulk single crystals of BiFeO$_3$ are not available, and thus, intrinsic single crystal properties of BiFeO$_3$ are not understood. We have succeeded in synthesizing the film version of single crystals using the novel flux mediated epitaxy (FME) using the combinatorial laser MBE. Substantially enhanced dielectric properties compared to ordinary thin films were observed.

(a) AFM image of standard BiFeO$_3$ film showing small grains. (b) Our FME BiFeO$_3$ film shows 10 times larger grains with much enhanced dielectric properties. (c) AFM detail shows unitcell order steps in our films optimized by combinatorial LMBE