Crystal growth and characterization of correlated electron oxide crystals

A. REVCOLEVSCHI
Laboratoire de Physico- Chimie de l'Etat Solide
University of Paris XI - Orsay France
http://www.u-psud.fr/lpces

In the last few years our solid state chemistry ORSAY group has carried out crystal growth experiments in various correlated electron oxide systems using the image-furnace floating-zone technique developed in the laboratory, and has studied various physical properties of the resulting cm-size crystals.

The studies have mostly concerned oxides such as low dimensionality cuprates (Bi_2CuO_4 ; superconducting $La_{2-x}Sr_xCuO_4$; pure and doped spin-Peierls $CuGeO_3$; copper chain systems such as $SrCuO_2$, Sr_2CuO_3, $BaCu_2Si_2O_7$ pure and doped with Ge; pure and doped spin-ladder $Sr_{14}Cu_{24}O_{41}$), nickelate La_2NiO_4, cobaltates La_2CoO_4 and $LaCoO_3$, CMR manganites (pure and substituted $La_{1-x}Sr_xMnO_3$, $(La,Sr)_3Mn_2O_7$, $La_{1-x}Sr_{1+x}MnO_4$) and, more recently, geometrically frustated magnetic compounds such as $CuFeO_2$ or of pyrochlore structure such as $Yb_2Ti_2O_7$ or $Gd_2Ti_2O_7$. Also ruthenates like Sr_2RuO_4.

Crystal growth conditions (growth rate, atmospheres, oxygen partial pressure…) will be briefly reviewed for some of these various compounds and data from neutron diffraction experiments, carried out to assess crystalline perfection will be presented.

Possible segregation of dopants during growth of some of the above compounds as well as oxygen non-stoichiometry will be discussed; influence of this segregation and of oxygen non-stoichiometry on the modification of physical properties will be analyzed.