

## Fabrication materials in BG group

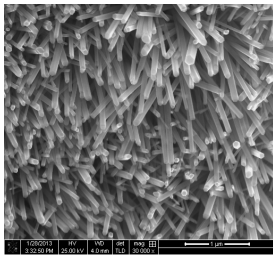
Library of Materials grown by BG group (along with AKR group)

BG group has extensive activity in the growth of materials like, metals, semiconductors, complex oxides, halides using several routes wet chemistry method, Physical vapour deposition techniques.

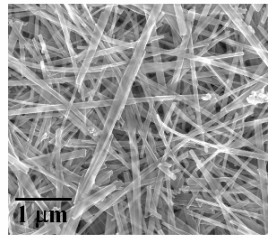
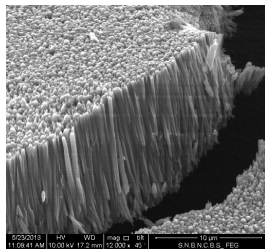
The group has gain extensive expertise in growth of nano materials of different shape, size and morphologies starting from nano particles nanowires, nanotubes, nanoribbons etc.

- nanowires of complex oxides of manganites, Nickelates, Cobaltates using wet chemistry route
- nanowires of ZnO, WO<sub>3</sub>, TiO<sub>2</sub>, IGZO, Si, Ge
- nanostructured film of WO<sub>3</sub>, manganites, TiO<sub>2</sub> etc using CSD techniques
- thin films with different surface morphology of perovskite halides grown by CSD technique
- Epitaxial films and multilayers of ZnO, Manganites, WO<sub>3</sub>, titanates on different Single crystalline substrates like; STO, NGO, Nb-STO, Pt-Si, LAO etc.

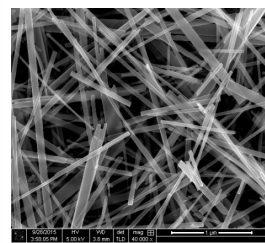
### Few examples of nanowires:



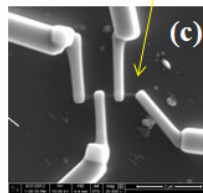
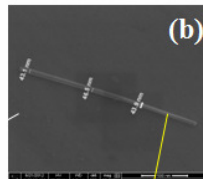
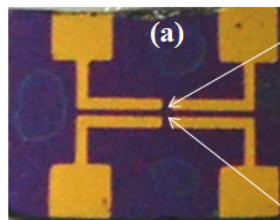
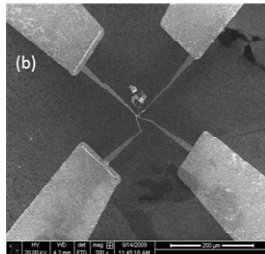
*ZnO and TiO<sub>2</sub> nanowires grown chemically*



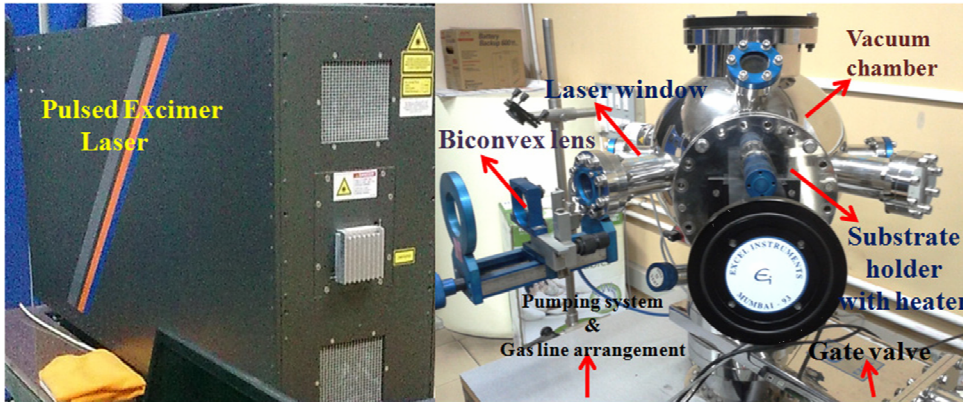
*Manganite nanowires by hydrothermal method*



BG group along with strong collaboration with Prof A.K.Raychaudhui's group has done extensive work on single nanowire based device fabrication using nanofabrication and nano lithography facility of centre and their measurements.

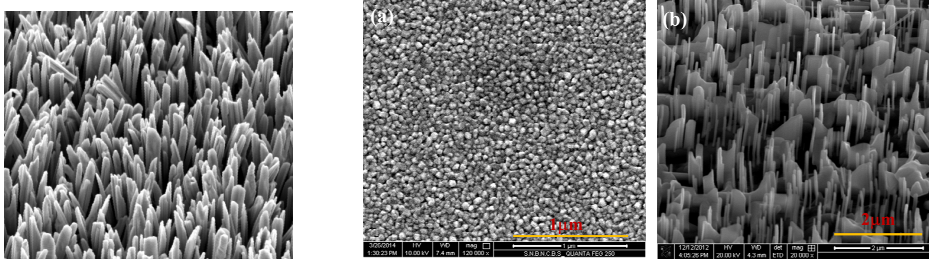


Single nanowire of manganite (diameter~45nm) connected by e beam lithography.



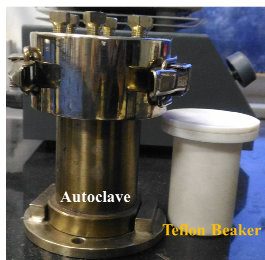
*Pulsed excimer laser at our centre*

Nanowire grown using pulsed laser deposition (PLD) technique is one of the unique technique developed in BG group.

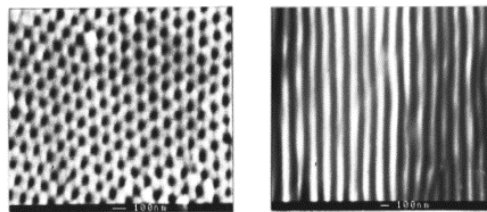


*WO<sub>3</sub> nanowire and nanocrystalline film grown by PLD*

Elemental semiconductor nanowires (like that of Si and Ge) are grown by vapour phase method in a multizone furnace. Some of the nanowires of complex oxides and metal nanowires grown in AAO template. Nanoparticles of metals like Au can also grown by physical method like dewetting a thin film grown on a Si substrate, nanoparticle complex oxides grown by wet chemistry route like sol-gel techniques and hydrothermal method.

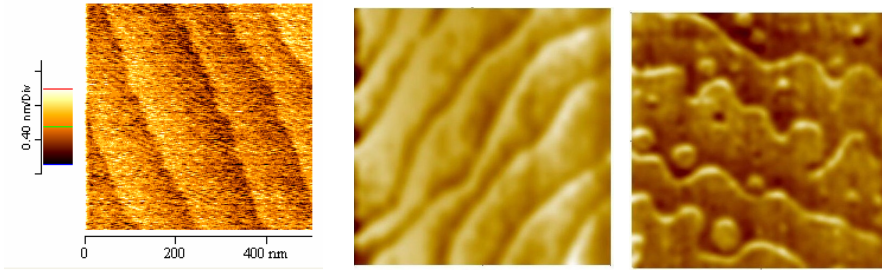


*Auto-clave for hydrothermal growth*



*AAO Template for nanowire growth*

**Thin films and multilayers** has been grown by using KrF excimer laser of wavelength 248nm. Oriented and epitaxial thin films of binary oxide and complex oxide are grown using PLD.



*AFM images of epitaxial thin films of oxides*