



Contribution ID: 23

Type: Oral

In Situ PXRD Studies of the Solvothermal Syntheses of WO_3 -Ethylenediamine Hybrid Nanowires and $\text{Bi}_2\text{Se}_x\text{Te}_{3-x}$ Nanoplatelets

Friday, 21 November 2014 14:15 (20 minutes)

Solvothermal syntheses are very versatile for fabricating nanostructured materials. While the majority of studies focus on materials syntheses, little attention has been paid to understanding the synthesis mechanisms, which are of vital importance to the rational design of synthesis for preparing optimized materials. In this context, *in situ* powder X-ray diffraction (PXRD) is ideal to study solvothermal materials syntheses as it is capable of providing direct reaction information under the harsh autoclave synthesis conditions. In this presentation, I will show the application of *in situ* PXRD in solving the mechanisms of the solvothermal synthesis of (1) WO_3 -ethylenediamine inorganic-organic hybrid nanowires, and (2) $\text{Bi}_2\text{Se}_x\text{Te}_{3-x}$ nanoplatelets. The WO_3 -ethylenediamine nanowires showed excellent performance in catalysis and water treatment and $\text{Bi}_2\text{Se}_x\text{Te}_{3-x}$ nanoplatelets are topological insulators that have potential applications in the electronic and optoelectronics areas. In the *in situ* PXRD experiments, solvothermal syntheses were conducted in quartz glass microreactors that were placed at the beam centre of the Australian Synchrotron powder diffraction beamline, and the time resolved PXRD patterns were recorded to follow the phase evolution during the synthesis. For both materials, *in situ* PXRD discovered intermediate phases that played an important role in controlling the formation of the final nanostructured materials.

Keywords or phrases (comma separated)

In situ PXRD, solvothermal synthesis, nanowires, nanoplatelets

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Session Classification: Advanced Materials II

Track Classification: Advanced Materials