Contribution ID: **31** Type: **Poster contribution**

In situ XRD study of sulfidation of pure and Cu-doped ZnO nanoparticles by H2S

Thursday, 5 July 2012 10:30 (1h 30m)

Hydrogen sulfide is a strong catalytic poison and its complete removal from gaseous streams is of key importance for successful industrial implementation of emerging technologies like low-temperature fuel cells (PEMFC) or Fischer-Tropsch synthesis. Currently the most successful approach to deep desulfurization (< 0.1 ppm S) relies on a gas-solid reaction between H2S and ZnO- based sorbents. However, the existing materials exhibit low sulfur capacity under mild conditions (200-300℃) needed for these applications. In order to improve the efficiency of the sorbents a detailed understanding of the mechanism of ZnO sulfidation would be highly desirable. To obtain the relevant information we applied in situ synchrotron radiation XRD to follow the transformation of ZnO and Cu-doped ZnO nanoparticles during their reaction with H2S. The sulfided samples were also characterized by transmission electron microscopy. Based on the obtained experimental data we will propose in our presentation an atomic scale description of the mechanism of ZnO-ZnS transformation.

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Session Classification: Poster Session

Track Classification: Catalysis