



Contribution ID: 197

Type: Poster

## Operando X-ray absorption spectroscopy (XAS) study of the selective CO methanation on Ru/TiO<sub>2</sub> catalysts: TiO<sub>2</sub> surface morphology effects

*Monday 17 September 2018 17:45 (15 minutes)*

Metal-support interactions in Ru/TiO<sub>2</sub> catalysts have a decisive impact on their catalytic activity and selectivity for CO methanation. These effects and the catalytic performance of the catalysts were found to change upon varying the surface area of the support, which is not yet well understood. One approach to explain this change would be a change in the surface morphology of the TiO<sub>2</sub> crystallites. In this study, we investigated Ru/TiO<sub>2</sub> catalysts with different TiO<sub>2</sub> morphologies for the selective CO methanation, employing anatase TiO<sub>2</sub> nanocrystals with preferentially {001}, {100}, and {101} oriented facets. The results indicate a significant impact of the TiO<sub>2</sub> surface morphology on the initial activation phase of the catalyst and its long-term stability. The Ru/TiO<sub>2</sub>-{001} catalyst reached its highest activity already in 5 min, then it started to continuously deactivate. For Ru/TiO<sub>2</sub>-{101} and Ru/TiO<sub>2</sub>-{100}, the activation was much slower, taking 150 and 300 min, respectively. Furthermore, these catalysts were very stable during >1000 min on stream. Based on operando XANES measurements, it could be demonstrated that under reaction condition ~ 95% of the Ru NPs on TiO<sub>2</sub>-{001} become metallic in 10 min, while it takes up to 80 min to reach the same state for TiO<sub>2</sub>-{100}. These observations indicate strong effects of the TiO<sub>2</sub> surface morphology on the electronic properties of the supported Ru NPs.

**Authors:** Dr CHEN, Shilong (Institute of surface chemistry and catalysis, Ulm University); Dr ABDEL-MAGEED, Ali M. (Institute of Surface Chemistry and Catalysis, Ulm University); Mr CISNEROS-ALVAREZ, Sebastian (Ulm University Institute of Surface Chemistry and Catalysis); Dr BANSMANN, J. (Ulm University Institute of Surface Chemistry and Catalysis); Prof. BEHM, R.J. (Ulm University Institute of Surface Chemistry and Catalysis)

**Presenter:** Dr CHEN, Shilong (Institute of surface chemistry and catalysis, Ulm University)

**Session Classification:** Poster session 1

**Track Classification:** P9 Catalysis