	Experiment title: In-situ XRD/XANES study of Fe2O3@CeO2 core-shell structures decorated with Pt nanoparticles for effective thermochemical water splitting	**Experiment number**: **ME 1444**
Beamline: BM31	**Date of experiment**: from: 19.04.2017 to 25.04.2017	**Date of report**: 25-07-2019
Shifts: 18	**Local contact(s)**: Michela Brunelli	*Received at ESRF:*

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Report:

Abstract

We report on the development of a bifunctional catalyst (Pt) - oxygen carrier (Fe_2O_3) that integrates the dry reforming of methane (DRM) into the chemical looping-based production of hydrogen. The material exhibits a high and stable methane conversion (ě 80%) and hydrogen yield (10.8 ȷmmol/g catalyst-oxygen carrier) with only a small quantity of impurities (CO, CO_2 < 2 ȷppm). The structural changes of the material are followed by operando X-ray powder diffraction and X-ray absorption spectroscopy coupled with gas chromatography. Insight into the evolution of the size of the Pt nanoparticles and their interaction with CeO_2 are probed by transmission electron microscopy and X-ray absorption fine structure analysis. Under DRM conditions, the Pt nanoparticles grow in size, however, their re-dispersion on the CeO_2 support (via PtO_x-support interaction) during air oxidation recovers their activity in the consecutive cycle. [1]

Publication:

1. Hosseini, D.; *Abdala, P. M.*; Donat, F.; Kim, S. M.; Müller, C. R., Bifunctional core-shell architecture allows stable H_2 production utilizing CH_4 and CO_2 in a catalytic chemical looping process. *Applied Catalysis B: Environmental* **2019**, 117946.