Contribution ID: **49** Type: **Poster contribution**

Redox pathways of CuO-based, Al2O3 stabilized oxygen carriers for chemical looping combustion

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

Chemical looping combustion (CLC) is one of the most promising CO2 capture processes. Copper oxide is an attractive candidate as oxygen carrier for CLC owing to its (i) exothermic reduction reactions, (ii) fast kinetics in both the reduction and oxidation reactions and (iii) low tendency for carbon deposition. To evaluate the potential of Cu-based oxygen carriers for CLC, the redox pathways of CuO with CO, H2 and CH4 must first be determined at operating conditions relevant for CLC. The aim of this work was to understand the reaction pathways of Cu-based, Al2O3-supported, oxygen carriers with H2. A co-precipitation technique was used to synthesize a Cu-rich (82 wt. % CuO) oxygen carrier.1 In-situ X-ray absorption spectroscopy (XAS) probing the redox reactions was performed at 500 ℃ using H2 and air as the reducing and oxidizing gases, respectively. Preliminary in-situ XAS measurements show that under the operating conditions studied here the reduction and the oxidation of Al2O3-stabilized CuO proceeded via the CuO –Cu2O –Cu transition. Additionally, it was observed that at 500 ℃ the Cu2O intermediate did not fully reduce to Cu (within a reaction time of 15 min). Furthermore, the induction period for the reduction reaction of co-precipitated CuO was found to be negligible at 500 ℃. These finding have important consequences with regards to the numerical modeling of the chemical looping process.

Primary author: Mr IMTIAZ, Qasim (ETH Zurich)

Co-authors: Dr KIERZKOWSKA, Agnieszka (ETH Zurich); Mr KOENIG, Christian (PSI Villigen); Prof. MÜLLER, Christoph (PSI Villigen); Dr NACHTEGAAL, Maarten (PSI Villigen); Mr BRODA, Marcin (ETH Zurich); Dr SAFONOVA, Olga (PSI Villigen); Prof. SCHILDHAUER, Tilman (PSI Villigen)

Presenter: Mr IMTIAZ, Qasim (ETH Zurich)

Session Classification: Poster Session

Track Classification: Materials / Nanomaterials