

## 物質科学セミナー

日時：平成 28 年 11 月 22 日（火） 17：30～

場所：筑波大学 3B213 プレゼンテーションルーム

講師：Prof. Dr. Malte Behrens (University of Duisburg-Essen, Germany)

講演タイトル：Copper Catalysts in Methanol Synthesis: From Understanding to new Materials

世話人：山本洋平（数理物質系 物質工学域 准教授）

共催：学際物質科学研究センター、数理物質融合科学センター

参加人数：約 20 名

DAAD-筑波大学パートナーシッププログラムの一環として、ドイツ Duisburg-Essen 大学 化学科 Malte Behrens 教授を講師に招き、銅-亜鉛触媒によるメタノール合成に関するセミナーを開催しました。また、セミナー後に交流会を開催しました。

### 【要旨】

## **Copper Catalysts in Methanol Synthesis: From Understanding to new Materials**

Prof. Dr. Malte Behrens, University of Duisburg-Essen, Germany

The synthesis of methanol from syngas is one of the routes in the chemical industry. In addition, the CO<sub>2</sub> hydrogenation reaction ( $\text{CO}_2 + 3 \text{H}_2 \rightarrow \text{CH}_3\text{OH} + \text{H}_2\text{O}$ ) is a preferred way for the utilization of carbon dioxide in the context of clean and sustainable fuel production. Cu/ZnO composite systems are employed in the industrial process, and are also the most promising starting point and benchmark for potential new CO<sub>2</sub> utilization processes.

The Cu/ZnO catalysts has been studied intensively with regard to the nature of the active sites, the reaction mechanism of methanol synthesis, the nature and function of the synergistic Cu-ZnO interaction and the role of additional promoters like Al<sub>2</sub>O<sub>3</sub>. Our approach focuses on the industrial high performance catalysts and its synthesis and structure-performance relationships.

Experimental and computational results show that copper can catalyse different routes to methanol via carbon monoxide and carbon dioxide, respectively. The presence or absence of the Zn promoter decides on the actual mechanism. The possibilities for catalyse optimization will be discussed.