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Program Title (English)　：Investigation of propane dehydrogenation properties of the vanadium and copper-based catalysts

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1. 概要（Summary ）

To understand the dehydrogenation process on transition metal-based catalysts, we were performed the in-situ XAFS measurement under C_3H_8 gas conditions. The oxidation state of the metal nanoparticles under an ambient environment is an important issue. The objective of this beamtime is to investigate variation in the role of the transition metal nanoparticles at 550 °C under the programmed gas conditions (process: He, O_2, CO_2, and C_3H_8 gas). A comparative study was performed on transition metal-based catalysts as a function of the metal species (Co, Fe, and Zn). We attempted to elucidate the difference of reaction sites of dehydrogenation conditions.

2. 実験（目的,方法）（Experimental）

Transition metal-based catalysts are attracting considerable interest due to their excellent ability for the activation of the C-H bond and high selectivity. Although the importance of these catalysts for propane dehydrogenation is well established, various issues still demand systematic investigations. It was found that the performance of the transition metal-based catalyst is significantly affected by (i) the synthesis method, (ii) the molecular structure of metal species and their physical and chemical characteristics, and (iii) the dispersion of catalytic species.

Figure 1 shows the *in-situ* XAFS experimental process of the transition metal catalysts under dehydrogenation conditions. The objective of this beamtime is to investigate variation in the oxidation state of the transition metals under reaction conditions.

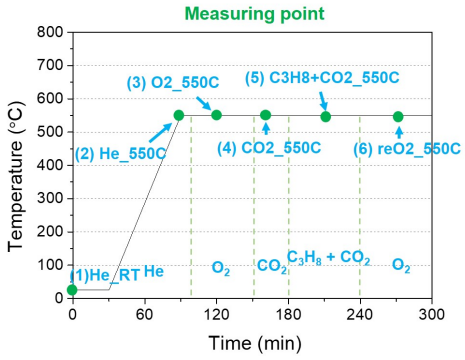

Figure 1. *In-situ* XAFS measurements of transition metal catalysts under dehydrogenation conditions.

3. 結果と考察（Results and Discussion）

We were performed the in-situ XAFS measurements of Co, Fe, and Zn catalysts supported on the ZrO_2 at Co, Fe, and Zn K edges in oxidation, reduction, and dehydrogenation conditions at 550 °C. The Co and Fe nanoparticles were continuously changed to the metal phase in He gas at 550 °C. The Co and Fe catalysts were also continuously changed the oxidation state as the gas conditions. However, Zn nanoparticles were not changed to the oxide to metal under reduction conditions. (H_2, CO_2, and C_3H_8 gas condition) We expected that different behaviors of the oxidation state of the transition metal under gas conditions will influence the C_3H_8 dehydrogenation.

4. その他・特記事項（Others）

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