二酸化炭素水素化反応における元素探索と複合化による挙動評価

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Systematic investigation of metal-supported catalyst and evaluation of combined effects for hydrogenation of carbon dioxide ([1]*Graduate School of Advanced Science and Technology, Japan Advanced Institute of Science and Technology*) ○Moeka Korekane,[1] Shun Nishimura[1]

Methanation and reverse water gas shift (RWGS) reactions have been received attracted attentions as carbon cycling technologies for the utilization of carbon dioxide via hydrogenation, and various systematic investigations of heterogeneous catalyst have been studied[1-3]. Herein, the reaction behaviors of each metal element and its locations on the periodic table are systematically evaluated in the hydrogenation reaction of carbon dioxide. In particular, extracted 15 metal elements from the periodic table have been compared by the yields of carbon monoxide and methane as the reaction temperature. It is observed that there are clear differences among the metal elements in the reactivity of CO_2 hydrogenation. Effect of combined use of elements such as binary-element supported catalysts are further examined. It is very interesting that some combinations of element exhibit specific performance, which is hardly expectable based on the catalytic behavior of the monometal-supported catalyst.

In this talk, the results of attractive catalyst behaviors in composition with the relevance of the elements located nearby on the periodic table area are discussed. Also, effect of ternary-metal supported catalyst would be demonstrated (in part).

Keywords : Hydrogenation of carbon dioxide; Reverse water gas shift; Methanation; Metal-supported catalyst; Combined effect

二酸化炭素の利用のために水素化反応を経た炭素循環技術としてのメタネーション反応や逆水性ガスシフト反応が注目され、様々な固体触媒システムが開発されている [1-3]。本研究では、各金属元素の反応挙動と周期表上での配置に着目し、二酸化炭素の水素化反応を体系的に評価した。周期表より 15 種の金属元素を抽出し、反応温度に対する一酸化炭素とメタンのそれぞれの収率変化を比較したところ、元素ごとに大きな違いがあることが確認できた。更に、金属元素を組み合わせたバイメタル触媒について金属の相互作用による触媒能の変化を探索した。バイメタル化挙動を考察したところ、単一の金属の触媒挙動からは予測できない特異な反応挙動を発現する組み合わせがあることが明らかとなった。

本発表では、特徴的な組み合わせ効果に注目し、周期表で近傍に位置する元素との関連性や金属元素を添加した際の挙動変化を交えて結果を示す。

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