

Development of Base Metal Nanocluster Catalysts for Liquid Phase Aerobic Oxidation of Alcohol

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From the viewpoint of an element strategy, the development of base metal catalysts is highly expected. Reducing the size of active species down to a few nanometers is a promising way to obtain the new catalysis, which arises from nano size effect as well as high population of active sites. Although nanoclusterization of the active species is one of the key trends in the solid catalyst chemistry, target elements were mainly focused on precious metals. In this study, the preparation of the base metal nanocluster on the support by using base metal colloid as precursor and the catalysis for the alcohol oxidation reaction in the liquid phase will be shown.

Among many base metals, the NiO will be focused. The obtained NiO nanocluster on the support was active for the 1-phenylethanol selective oxidation toward acetophenone.

In the case of using an activated carbon (AC) as the support, molecular oxygen (O_2) was activated on the AC and peroxy radical was produced, followed by hydrogen abstraction from 1-phenylethanol and production of carbon radical [1]. On the other hand, hydrotalcite support promoted the OH group dissociation and produced Ni-alcoholate [2]. Both case, reaction proceeded at the interface between NiO nanocluster and the support. Interfacial structure of nanocluster and the support is the key issue to show the high activity.

References

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- [2] T. Sasaki, N. Ichikuni, T. Hara, S. Shimazu, Chem. Lett. **48**, 374 (2019).

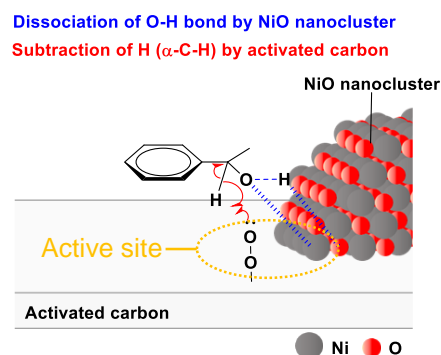


Figure 1. Proposed activation process of the alcohol oxidation reaction on activated carbon supported NiO nanocluster catalyst [1].