Porous Ionic Crystals Based on Lindqvist-Type Polyoxometalates for Olefin Epoxidation

([1]*Graduate School of Arts and Science, The Univ. of Tokyo*) ○Ailing Gao,[1] Tsukasa Iwano,[1] Sayaka Uchida [1]

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The epoxidation of olefins is an important reaction in the chemical industry. Polyoxometalates (POMs) are a class of early-transition-metal oxides and have demonstrated remarkable catalytic performance in selective oxidation of olefins.[1] Recent research has focused extensively on achieving the heterogenization of homogeneous POM catalysts to address their drawbacks. Various preparation strategies have been developed to create heterogeneous POM-based catalysts.[2] These strategies include self-assembling POMs with organic compounds to form supramolecular structures.[3]

Currently, research on POM based materials for olefin epoxidation reactions are mainly focuses on the Keggin $[XM_{12}O_{40}]^{n-}$ and Dawson $[X_2M_{18}O_{62}]^{n-}$ types, while studies on the Lindqvist-type ($[M_6O_{19}]^{n-}$) POMs are relatively scarce. Therefore, we synthesized five novel Lindqvist-type POM based porous ionic crystals (PICs) named $H_{n-4}[Cr_3O(OOCC_6H_5)_6(H_2O)_3]_4[M_6O_{19}](OH)_{4-n}$ and investigated their performance in olefin epoxidation reactions. We characterized the five novel PICs using IR, PXRD, TG, CV and SXRD etc., and the results demonstrated successful synthesis. Additionally, GC was employed to study the conversion and selectivity of olefin epoxidation, revealing excellent catalytic performance (Figure 1). Furthermore, the catalyst can be recycled after the reaction and reused at least twice.

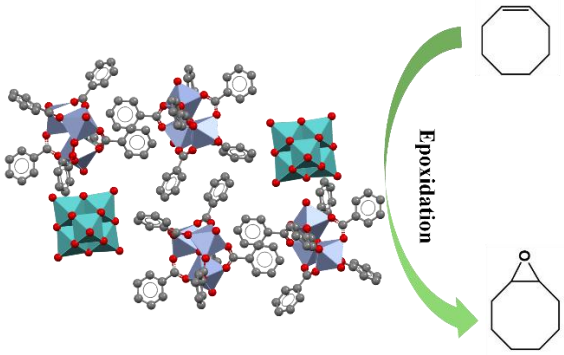

Figure 1. Schematic illustration of cyclooctene's epoxidation using Lindqvist-type POMs based PIC.

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