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Friedel-crafts alkylation on mesoporous W-Zr composite oxide catalysts prepared by a wall ion-exchange method

Masakazu Iwamoto, Masashi Tanaka, Insuhk Suh, Kohei Kabeya and **Haruro Ishitani**
Chuo University, Japan

The wall ion-exchange (WIE) method, in which wall anions in composites of zirconium sulfate and surfactant micelles (ZS) were exchanged for oxyanions in aqueous solutions, was applied to prepare mesoporous tungsten-zirconium composite oxide (WZO). The amounts of tungsten introduced into the ZS structure (Win) were very small at pH=2-5 and greatly increased at pH=5.6 and above. In the exchange at pH=5.6-10, the ratios of tungsten introduced and sulfur removed were 0.9-1.1, indicating the stoichiometric ion-exchange. This would result from the difference of predominant tungsten oxyanions in the solutions, $W_{12}O_{39}^{6-}$ (the diameter, 0.7 nm) at the low pH and WO_4^{2-} (0.27 nm) at high pH, since the diameter of the latter is very similar to that of the HSO^{4-} ion (0.21 nm) in ZS, resulting in the easy WIE reaction. The relationships among the amount of Win, the removal method of the surfactants, the surface area and the pore diameter of WZOs were systematically studied and WZO samples with high surface areas of 200-520 m^2g^{-1} and pore diameters of 0.8-2.4 nm could be prepared. The catalytic activity of the resulting WZO for the Friedel-Crafts alkylation was strongly dependent on the removal method of the surfactants and the W/Zr ratio. The WZO samples prepared with calcination or extraction showed low activity for the catalysis, while the extracted and then calcined WZOs with W/Zr>0.45 were specifically active. The activity was well proportional to the amount of mono-dentate W species produced in the pore surface of the WZO samples.

Biography

Masakazu Iwamoto has completed his PhD from Kyushu University, Japan and Post-doctoral study from Texas A&M University. He was an Associate Professor at Nagasaki University, and Professor at Miyazaki University, Hokkaido University and Tokyo Institute of Technology. He has published more than 300 papers, was an Editor-in-chief of *Applied Catalysis B* and *Environmental* and works for Chuo University as an Institute Professor.

rockbasejp@gmail.com

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