Honeycomb-like Mesoporous NiO–SnO₂/SO₄²⁻ Solid Superacid for the Efficient Reaction of Methanol Oxidation

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NiO–SnO₂/SO₄²⁻ solid superacid is fabricated to enhance electrochemical performance of methanol (CH₃OH) catalytic oxidation. A novel honeycomb-like mesoporous SnO₂ is synthesized by the method of removing carbon sphere template. Sulfate ions are introduced into the SnO₂ to form the solid superacid SnO₂/SO₄²⁻. Cheap nickel-based materials are doped on the superacid to fabricate the NiO–SnO₂/SO₄²⁻ materials. In the methanol catalytic oxidation, the NiO–SnO₂/SO₄²⁻ catalyst exhibits the highest catalytic activity compared with NiO–SnO₂ and pure NiO. As a promoter, honeycomb-like SnO₂ with a larger surface and acid sites could offer more surface hydroxyl groups, which speeds the conversion of intermediate CO species to CO₂ so as to improve the electrocatalytic activity and poisoning-resistant of the catalysts. The present work provides a novel solid superacid nanomaterial and new opportunities to the rational design of catalysts with efficient catalytic performance for methanol.

Keywords: Solid superacid, Honeycomb structure, Tin dioxide, Nickel oxide, Methanol oxidation

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