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PT NANOPARTICLES CONFINED WITHIN CERIUM-BASED METAL ORGANIC FRAMEWORK FOR TOLUENE OXIDATION

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Ce-BTC, a kind of lanthanide metal organic frameworks, is characterized by large surface areas and good thermal stability. The incorporation of noble-metal nanoparticles in MOFs (Metal Organic Frameworks) have attracted much attention in catalytic field. We utilized in situ MOFs growth strategy to synthetize Pt@Ce-BTC that Pt nanoparticles was pre-stabilized by polyvinylpyrrolidone. X-ray diffraction, Fourier transform infrared, scanning electron microscope and transmission electron microscopy demonstrated the integral structure and excellent crystallinity of Pt@Ce-BTC with no Pt nanoparticles aggregation. Nitrogen adsorption-desorption results exhibited that both the Ce-BTC and Pt@Ce-BTC displayed type isotherms which indicated microporosity. The obtained Ce-BTC and Pt@Ce-BTC were diluted by quartz sand and loaded in a continuous flow microreactor to test the catalytic activity, which the toluene (100 ppm) was delivered by 20% O2 in N2 with a total flow rate of 80ml min-1. From the catalytic results, pure Ce-BTC without Pt nanoparticles showed no activity, which indicated that organic links, Ce oxide secondary building unit, and their defective sites did not contribute to the catalytic reaction. As comparison, Pt@Ce-BTC exhibited excellent activity, durability and reusability for oxidation of low concentration toluene, which suggested that the exposing plane (111) of Pt nanoparticles played a primary role in toluene oxidation. In addition, Pt@Ce-BTC remained intact and maintained their crystal structure with catalytic deactivation after three runs. A facile in situ MOFs growth strategy was used to immobilize Pt nanoparticles within Ce-BTC framework matrix with high dispersion, which solved the aggregation problem. Furthermore, the functional Pt@Ce-BTC showed potential application in catalytic field as promising heterogeneous catalysts due to the excellent activity, durability and reusability.

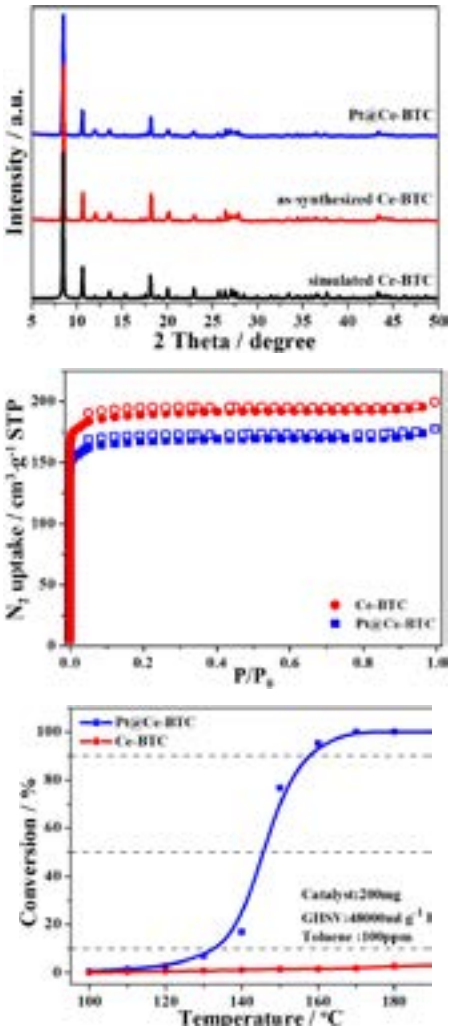

Figure 1: (a) XRD patterns of Ce-BTC and Pt@Ce-BTC; (b) N2 adsorption-desorption isotherm of Ce-BTC and Pt@Ce-BTC; (c) Conversion of toluene over Ce-BTC and Pt@Ce-BTC.

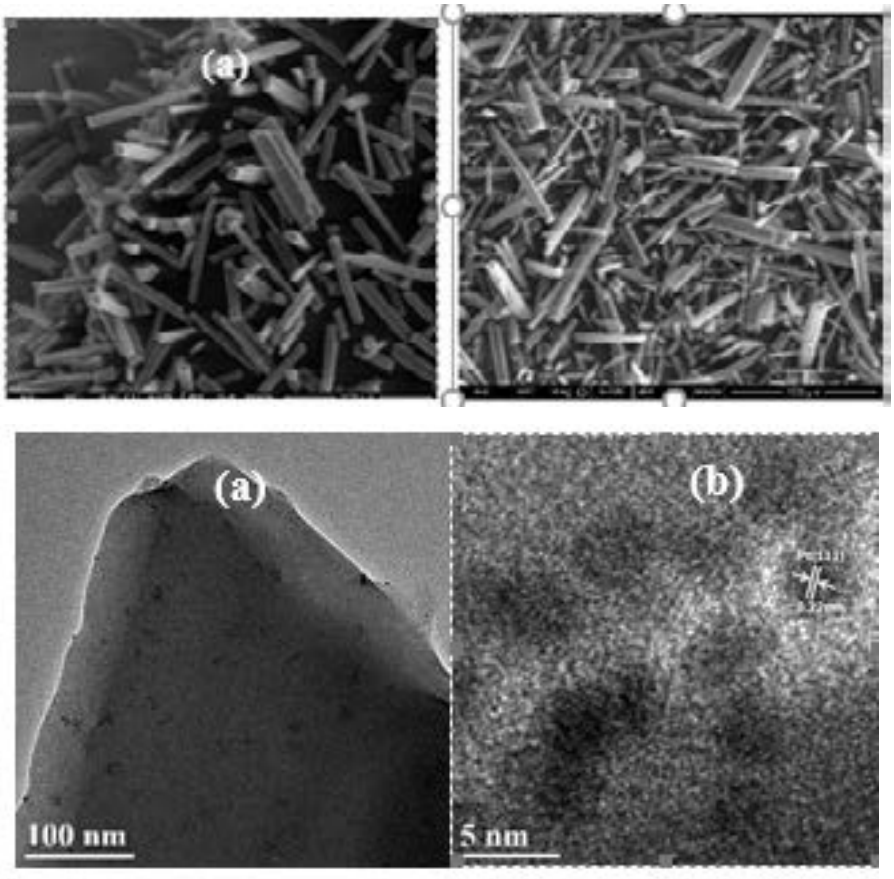

Figure 2: (a) and (b) SEM image of Ce-BTC; (c) TEM image of Pt@Ce-BTC; (d) exposing plane of Pt@Ce-BTC.

Biography

Hui He received his Bachelor's Degree from South China University of Technology, China in 2016 and now he is a graduate student in grade two in School of Environment and Energy, at the same university. He majorly works on the synthesis and functionality of metal organic frameworks field. He has published a paper in the *journal Applied Catalysis B: Environmental.*

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