Melted imidazole as solvent to fabricate a porous carbon supported catalyst

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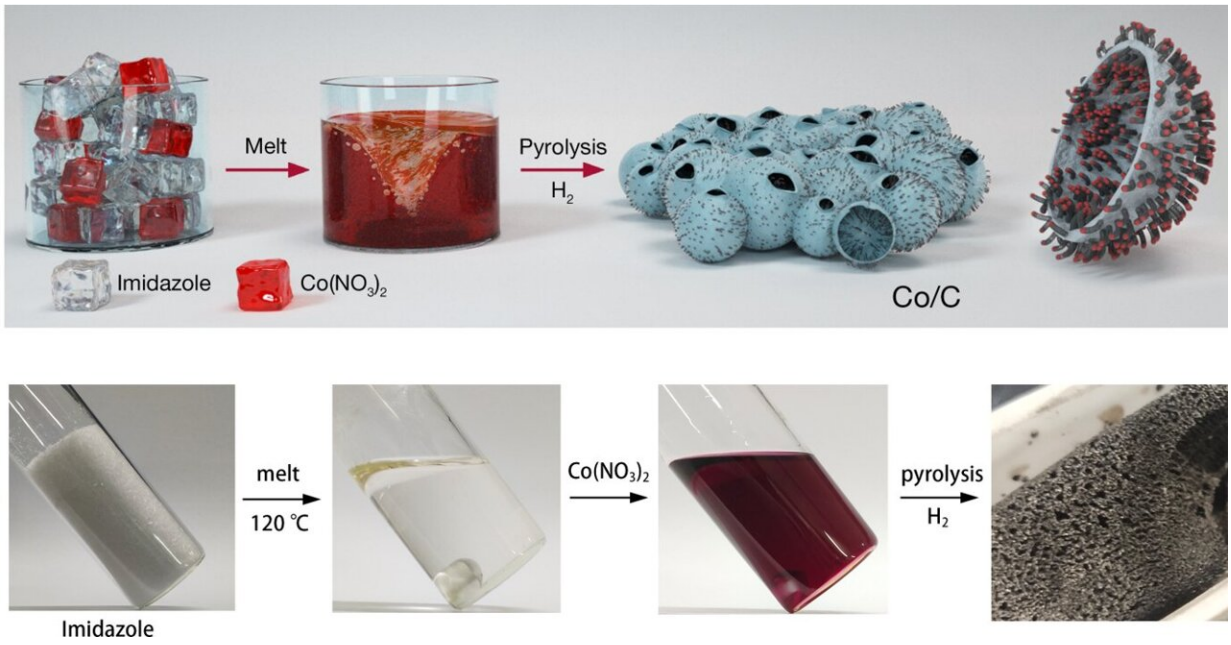

Schematic illustration for the synthesis of Co/C and the photograph of the synthesis steps. Credit: Science China Press

This study is led by Dr. Shaojun Dong (Changchun Institute of Applied Chemistry, Chinese Academy of Sciences). At the beginning of this work, researchers wanted to design a simple method to synthesize Co nanoparticles. This is because that the Co NPs are very active for various catalytic reactions such as dehydrogenation and hydrogenation reactions, the selective oxidation of alcohols, and Fischer–Tropsch syntheses.

Encapsulation of Co NPs with porous carbon is an effective approach for preventing aggregation and leaching of Co NPs, thus improving their activity and stability. "In most synthesis methods, the carbon sources are often solid materials, which need additional solvent to dissolve and re-separate. If these carbon sources can be melted and used as solvents, the synthesis steps will be greatly simplified" Shaojun says.

After experimenting with a large number of different kinds of small organic molecules, the team finally found that imidazole has a low melting point and high solubility for cobalt ions, which is very suitable for the synthesis of carbon supported cobalt nanoparticles. The whole synthesis process only needs two steps. The porous structure of the synthesized material is evenly distributed with a large number of cobalt nanoparticles on the surface. "We were shocked by the first SEM image of the material. This is beyond our expectation," Jinxing says.

The team found that the multi-dimensional carbon supported Co nanoparticles (Co/C) catalyst simulating the function of natural NADH oxidase. The Co/C nanoparticles can consume NADH in cancer cells, induce the increase of reactive oxygen species, lead to the damage of oxidative phosphorylation and the decrease of mitochondrial membrane potential, and lead to the damage of ATP production.

More information: Jinxing Chen et al, Bubble-templated synthesis of nanocatalyst Co/C as NADH oxidase mimic, *National Science Review* (2021). DOI: 10.1093/nsr/nwab186

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