

Morphology Control and Innovative Performance Enhancement of Titania-based Non-platinum Catalyst for Fuel Cells by Using NaCl-based Mixed Molten Salts

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Summary

N Oxide catalysts have been developed to replace platinum-group-metal catalysts in polymer electrolyte fuel cell cathodes while the oxygen reduction reaction (ORR) activity remained moderate. Recent breakthrough in the ORR activity was achieved by replacing the carbon supports with hydrothermally synthesized Ti_4O_7 fibers while the fibrous morphology was broken to form particles during the nitrogen-doping process owing to the harsh conditions. In this study, titania nanotubes (TNTs) were synthesized under a molten-salt flux. Effect of the crucible components, molten salt types and synthesis temperature on the TNT's morphology were investigated. The TNTs with a high aspect ratio of ~50 were successfully grown from TiO_2 nanoparticles in a mixture of NaCl and $(\text{NaPO}_3)_6$ at 825°C. They were durable against nitrogen doping not to be broken to particles and exhibited ORR activity in acidic media.