

One-pot synthesis of phosphorus-doped ordered mesoporous carbon with large pore for metal-free electrocatalytic oxygen reduction

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Polymer Electrolyte Membrane Fuel Cell (PEMFC) takes center stage as the next generation energy devices. PEMFC directly converts the chemical energy of hydrogen fuel to electricity with high energy conversion efficiency and low pollution. However, sluggish oxygen reduction reaction (ORR) and expensive cost of platinum hinder the commercialization of PEMFC. Therefore, many kinds of catalysts without platinum are suggested. Hetero atom doped carbon is also suggested for the ORR catalysts in alkaline medium with good activity and competitive price. We report the facile one pot synthetic method for phosphorus-doped ordered mesoporous carbon with large pore (about 30 nm) through the self assembly of amphiphilic diblock copolymer PEO-b-PS. Resol and TEOS are used as hydrophilic precursor for carbon and silica which interact with PEO block to form the wall of mesoporous structure, and hydrophobic tri(p-tolyl)phosphine (TPTP) is used as precursor for phosphorus which interact with PS block to conduct selective doping on the surface of pore wall. Therefore, we can obtain analogous activity to previously reported result with relatively low amount of doping.