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Communication

Comparable electrocatalytic performances of carbon- and Rh-loaded SrTiO₃ nanoparticles

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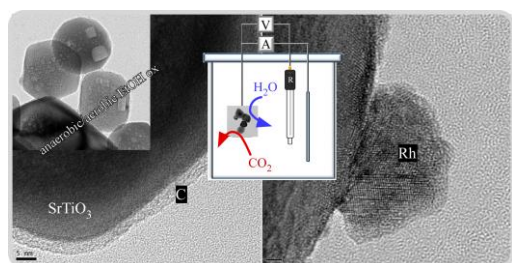
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Graphical Abstract



Both metallic Rh and nonmetallic carbon modifications can highly improve the electrocatalytic activity of SrTiO₃ nanoparticles. Carbon modifications was achieved by aerobic and anaerobic ethanol oxidation methods.

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ABSTRACT

Carbon- and Rh-loaded strontium titanate (SrTiO₃) nanoparticles (NPs) were synthesized respectively by the wet impregnation method and the aerobic and anaerobic ethanol oxidation methods, and characterized by scanning electron microscopy, high resolution transmission electron microscopy, X-ray diffraction crystallography, UV-visible absorption, Raman spectroscopy, and X-ray photoelectron spectroscopy. Carbon was shown to be uniformly coated on SrTiO₃ NPs by the aerobic and anaerobic ethanol oxidation methods. Electrocatalytic activities of unmodified and modified SrTiO₃ NPs were tested for water splitting and CO₂ reduction. The aerobic C-coated and Rh-loaded SrTiO₃ catalysts showed comparable activity that was increased by >10-fold of that of unmodified SrTiO₃ catalyst. These results demonstrate that both metallic and nonmetallic surface modifications can highly improve the electrocatalytic activity of SrTiO₃ NPs and point to highlight a more important role of the modifier in the electrocatalytic reactions than of the SrTiO₃ structure.

Cubic crystal phase strontium titanate (SrTiO₃) exhibits an indirect band gap of ~3.2 eV (and a direct band gap of 3.75 eV) and has extensively been applied to energy (*e.g.*, overall water splitting) and environment (*e.g.*, pollutant removal) as a catalyst [1-15]. Many efforts have been devoted to increase catalytic performance by tailoring bulk/surface morphology and crystallization (*e.g.*, by controlling exposed facet, defect and porosity formation), and by hybridizing two or more different materials (*e.g.*, doping and Z-

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