Basic Research

New PtFeIr Nanowires Prepared for Stable Oxygen Reduction Reaction

Pt-based alloy nanowires are promising oxygen reduction reaction (ORR) catalysts. It is widely accepted that intermetallic Pt-based alloys with face-centered tetragonal (fct) structure are more stable than corresponding disordered Pt-based alloys with face-centered cubic (fcc) structure.

However, nanowires are unstable under high temperatures. The synthesis of fct-phase Pt-based nanowires under the phase transformation process remains a significant challenge.

Besides, the dissolution of transition metals during acidic conditions will result in their structural collapse and activity loss. Consequently, the improvement of the stability of nanowires is highly desirable.

Chinese scientists have recently prepared stable fct-phase Pt-based intermetallics in nano-scaled size.

This research, published online in *Angewandte Chemie International Edition*, was directed by Prof. ZHANG Tierui and Dr. SHANG Lu from the Technical Institute of Physics and Chemistry (TIPC) of the Chinese Academy of Sciences.

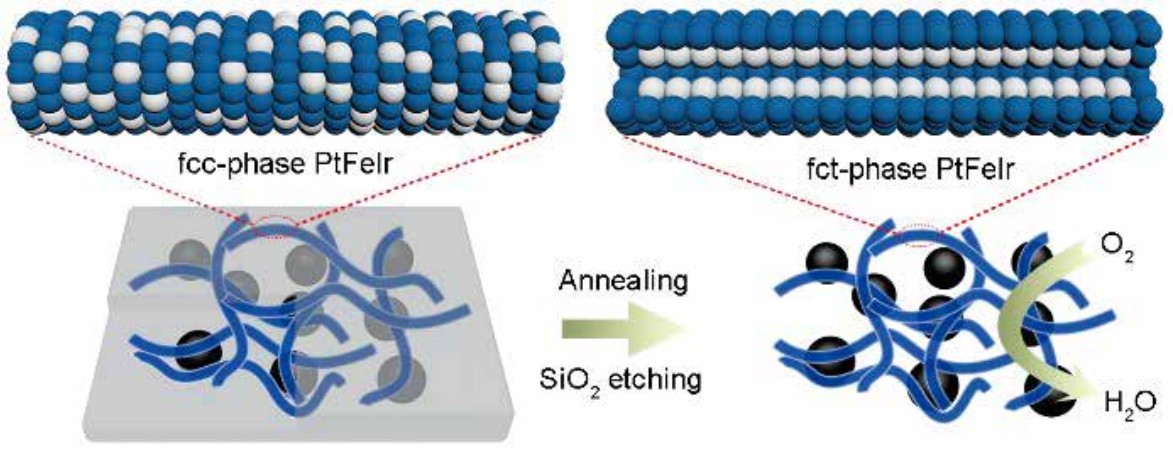
In this work, researchers report the synthesis of fct-phase PtFeIr ordered intermetallic nanowires with an average diameter of 2.6 nm for ORR for the first time.

Original fcc-PtFeIr catalyst is coated with SiO_2 and becomes fct-phase PtFeIr nanowires. With the protection of SiO_2 cover, it retards the aggregation and breakage of nanowires. Meanwhile, the existence of Ir guarantees the thermal stability of catalysts and promotes the phase transformation of nanowires.

By taking electrochemical tests, the results indicate that the mass activity of PtFeIr nanowires has increased by over 80% after phase transformation for ORR.

On the other hand, their experimental result has shown that a "new" ordered structure slows down the dissolution of Fe in ORR.

Researchers suggest that fct structure Pt-based alloy nanowires prepared in this study can be applied in more applications to ensure an efficient and stable ORR.



The schematic diagram for preparing fct-phase PtFeIr Nanowires for the oxygen reduction reaction. (Image by ZHANG *et al.*)

(TIPC)

Reference

Z. Yang, H. Yang, L. Shang, T. Zhang, (2022) Ordered PtFeIr intermetallic nanowires prepared through a silica-protection strategy for the oxygen reduction reaction. *Angewandte Chemie, International Edition in English* 61, e202113278. doi: 10.1002/anie.202113278.