Novel electrocatalyst for proton-exchange membrane fuel cells

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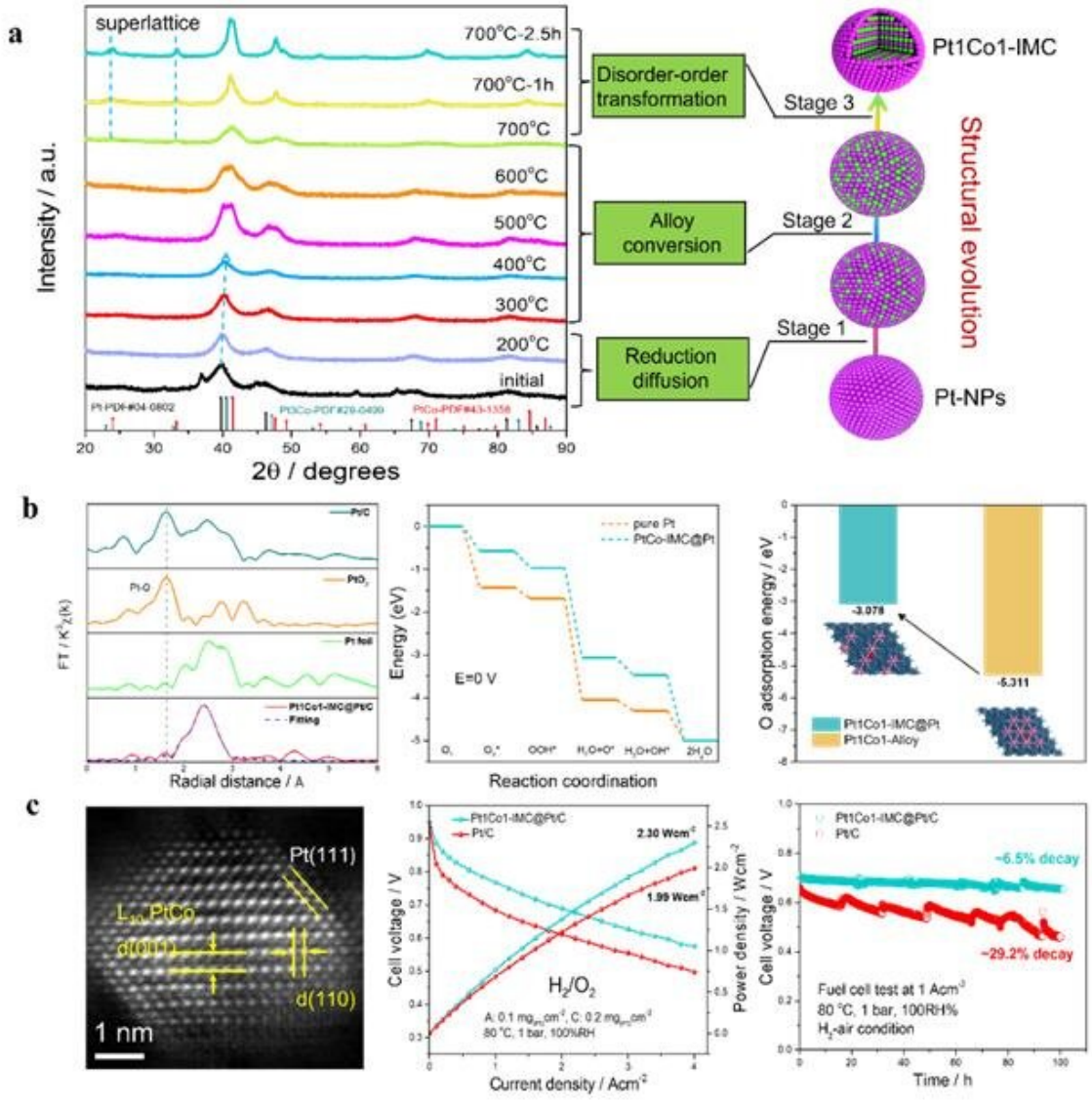

Structural feature and electrocatalytic performance of the prepared PtCo-IMC

catalysts. Credit: Prof. YANG's group

Highly active and durable low-Pt (platinum) electrocatalysts that can dramatically reduce costly Pt usage in the oxygen reduction reaction (ORR) are urgently required for the commercialization of fuel cell vehicles. Cost-effective, Pt-based intermetallic (IMC) catalysts have been regarded as the most promising alternative to boost activity and durability towards ORR; however, the formation of high-loaded Pt-based IMCs usually involves high-temperature annealing, which leads to severe agglomeration and nonuniformity of IMC nanoparticles (NPs), imposing an enormous challenge on efficient synthesis.

Motivated by this challenge, an interdisciplinary research team led by Prof. Yang Hui and Prof. Jiang Zheng from the Shanghai Advanced Research Institute of the Chinese Academy of Sciences recently reported a high-loaded (44.7 wt.%) and sub-6 nm Pt IMC catalyst that can be controllably synthesized through a cobalt oxide aided structural evolution strategy. Results were published in *Energy & Environmental Science*.

According to the researchers, the as-prepared catalyst exhibited superb electrocatalytic performance for the ORR with a greatly enhanced mass activity and durability in model electrode measurements.

Impressively, the resultant catalyst delivered a record-high power density and extraordinary stability. Particularly, the mass activity calculated from fuel cell in MEA configuration exceeded the Department of Energy (DOE) 2020 automotive target and very close to the intrinsic value, indicating that excellent activity can be highly efficient expression under proton exchange membrane fuel cell operating conditions.

The synthetic approach developed in this study provides a feasible strategy for the development of high-loaded, small-sized fuel cell electrocatalysts with high activity expression, paving a new way for future practical application of low-Pt catalysts in fuel cells.

More information: Qingqing Cheng et al, High-loaded sub-6 nm Pt1Co1 intermetallic compounds with highly efficient performance expression in PEMFCs, *Energy & Environmental Science* (2021). DOI: 10.1039/D1EE02530A

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