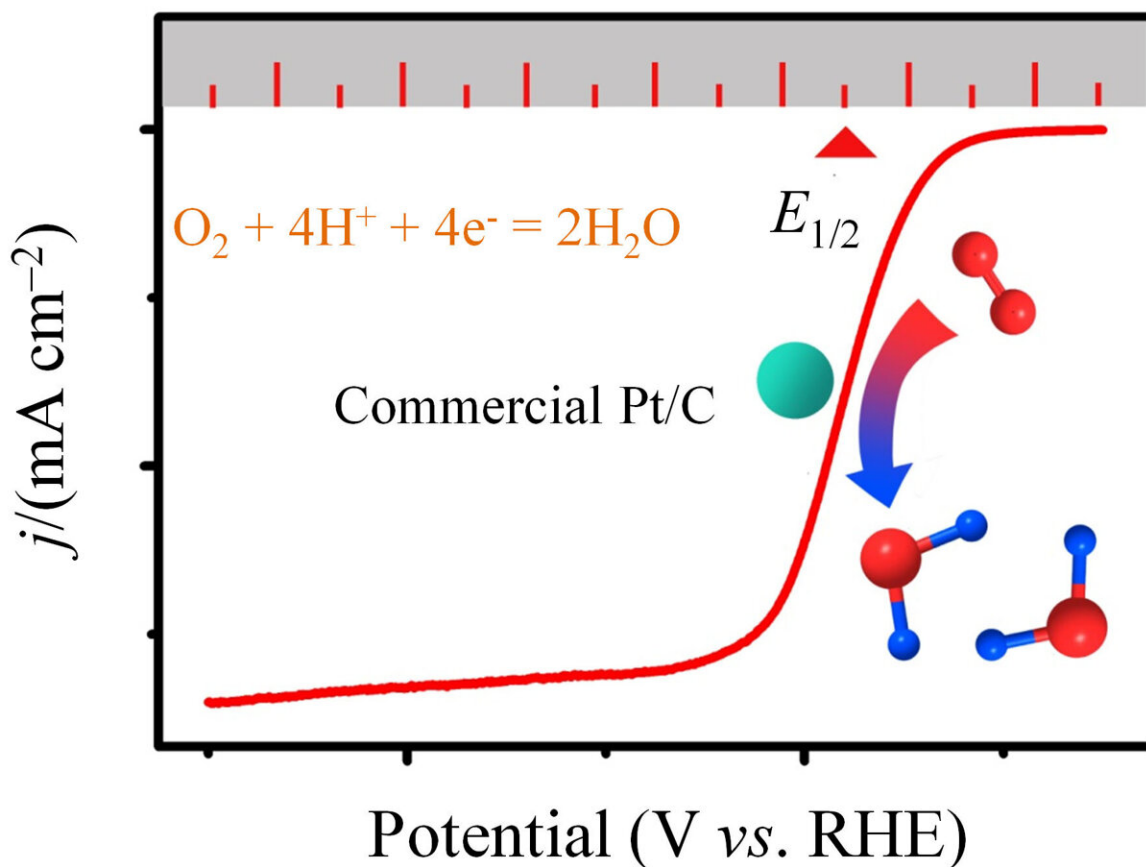


Harnessing 'big data' via meta-analysis of commercial Pt/C measurements for oxygen reduction reaction

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Via data mining about commercial Pt/C from 514 references, researchers revealed a reliable standard reference for the evaluation of new ORR electrocatalysts from different laboratories. Credit: Chinese Journal of Catalysis

Developing low-cost and highly efficient electrocatalysts for oxygen reduction reaction (ORR) to replace commercial Pt/C has always been desired to greatly reduce the cost of polymer electrolyte membrane (PEM) fuel cells. The parameter of half-wave potential ($E_{1/2}$) obtained from linear-sweep voltammetry (LSV) in O_2 -saturated acid/alkaline medium on a rotating disk electrode (RDE) is commonly used for characterizing the ORR performance of all kinds of new electrocatalysts. With higher value of $E_{1/2}$, the ORR performance becomes better. For comparison, the $E_{1/2}$ value of Pt/C is extensively used as a benchmark.

The intrinsic activity of a Pt/C catalyst should be fixed in principle, while the $E_{1/2}$ value of the same type of commercial Pt/C catalyst obtained in different labs varies in a wide range. Many factors, such as [electrolyte](#), diameter of the electrode, Pt loading, scan rate, iR-corrected or not, positive or negative scan performed, even some [human factors](#), etc., seem to affect the obtained final "apparent" ORR performance of a Pt/C [catalyst](#). Such fact makes it difficult to objectively evaluate the ORR activity of new electrocatalysts from different laboratories.

Recently, a research team led by Prof. Weilin Xu from Changchun Institute of Applied Chemistry, CAS and University of Science and Technology of China conducted a meta-analysis of the ORR performance of commercial Pt/C via [data mining](#) from 514 references to reveal the optimal testing conditions for the most repeatable ORR performance of commercial Pt/C in both acid and alkaline electrolytes; the optimal Pt loading was $20 \mu\text{g}/\text{cm}^2$ on a 4 mm glassy carbon working electrode. The value of $0.84 \pm 0.03 \text{ V}$ was suggested as the "golden reference" of the commercial Pt/C (with Pt 20 wt.%) ORR half-wave potential for the performance evaluation of other ORR catalysts in both acid and alkaline electrolytes.

More information: Mingbo Ruan et al, Meta-analysis of commercial Pt/C measurements for oxygen reduction reactions via data mining,

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