

전기화학반응을 위한 불균일계 백금 단원자 촉매(Single atomic platinum catalysts for electrochemical reactions)

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As a catalyst, single-atom platinum may provide an ideal structure for platinum minimization. Herein, single-atom catalyst of platinum supported on titanium nitride nanoparticles were successfully prepared with an aid of chlorine ligands. Unlike platinum nanoparticles, the single-atom active sites predominantly produced hydrogen peroxide in the electrochemical oxygen reduction with the highest mass activity reported so far. The electrocatalytic oxidation of small organic molecules, such as formic acid and methanol, also exhibited unique selectivity on the single-atom platinum catalyst. A lack of platinum ensemble sites changed the reaction pathway for oxygen reduction reaction toward two electrons pathway and formic acid oxidation toward direct dehydrogenation, and also induced no activity for methanol oxidation. This work demonstrates that the single-atom platinum can be an efficient electrocatalyst with a high mass activity and unique selectivity.