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Deciphering acetaminophen electrical catalytic degradation using single-form S doped graphene/Pt/TiO₂

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Abstract

As the efficiency of electrocatalysis is depended on the characteristics of anode materials, heteroatom doping was applied to improve the physicochemical, electromagnetic, and structure properties of grapheme considering that the efficiency of electrocatalysis depends on the characteristics of anode materials. However, the mechanism underlying efficiency promotion remains unclear due to the complicated doping species of heteroatom. Single-form S loaded S/graphene/Pt/TiO₂ (S-GN/Pt/TiO₂) was prepared for the first time by using radical as precursor to clarify the function of S doping. The catalytic center for direct (pollution oxide on anode) and indirect electro-oxidation (pollution oxide by radicals) was then confirmed by density functional theory (DFT) calculation. Results indicated that C atom besides SO_x is the active site for direct oxidation of acetaminophen (APAP), and SO_x is the active site for indirect oxidation for the generation of HO•. Furthermore, the effect of some parameters (such as S content, pH, applied current, temperature) and oxidants generated through different electrolytes were also completely deciphered in this study. GC-MS analysis was implemented to identify intermediates of APAP after electro-oxidation (i.e., eight types of intermediates identified) and the possible pathway of degradation was proposed. The single form S doping approach and S

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