Highly Efficient Electrocatalytic Oxidation of Sterol by Synergistic Effect of Aminoxyl Radicals and Se-Ni5P4

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Abstract

The exploration of efficient and environmentally friendly oxidation method is highly desirable to overcome the critical problems of poor selectivity and heavy metal contamination for the fine chemicals industry. Herein, a self-supported 3D Se-Ni5P4 nanosheet electrocatalyst was rationally designed and fabricated. Benefiting from the synergistic effect of aminoxyl radical and mesoporous Se-Ni5P4/GF, an excellent performance of [?]98% selectivity and 33.12 kg/(m3·h) space-time yield was obtained for sterol intermediate oxidation with the enhanced mass transfer effect of the continuous flow system. The doping of anionic selenium and phosphorus modulated the electronic structure of Se-Ni5P4, and the oxyhydroxides generated by surface reconstruction accelerated the turnover of TEMPO, thereby enhancing the intrinsic electrocatalytic activity. A scale-up experiment was conducted with stacked-flow electrolyzer demonstrated the application potential. This work provided an efficient synergistic electrocatalytic strategy to facilitate rapid electron and mass transfer for electrochemical alcohol oxidation and highlighted the potential for practical electrosynthesis applications.

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