

Development of electrocatalyst with high performance towards the electrochemical synthesis of adiponitrile and nitrophenol

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Electrochemical hydrogenation with water as the proton source serves as a clean and sustainable alternative to the industrial organic synthesis (e.g., adiponitrile or 4-aminophenol) and even upcycling of chemical waste into value-added chemicals, but developing high-performance electrocatalyst still remains challenging. In this presentation, we report on the development of a facile electroless plating method to prepare Earth-abundant materials-based electrocatalyst with high performance for the electrosynthesis of platform chemicals, including (i) adiponitrile, a building block for the synthesis of Nylon 6,6, via electrohydrodimerization of acrylonitrile, and (ii) 4-aminophenol, an intermediate for the synthesis of drugs, via electrochemical hydrogenation of 4-nitrophenol. The electrocatalyst can be prepared at ambient conditions within several minutes even half a minute. The developed electrocatalyst exhibited promising catalytic performance, including (i) a turnover frequency of $\sim 290\text{ h}^{-1}$ with high selectivity ($\sim 90\%$) for adiponitrile production, and (ii) a turnover frequency of $\sim 53.0\text{ h}^{-1}$ with high selectivity ($> 90\%$) for 4-aminophenol production.