A kinetic study on the electrochemical hydrogenation of *N,N*-dimethylformamide to trimethylamine

Ruilong Jia^{1,*}, Haixin Liu¹, Shanshan Li², Yujiao Lian¹, Yan Dai¹, Yingli Wang^{1,*}

¹ Center of Laboratory Management, Shanxi University of Traditional Chinese Medicine, Jinzhong 030619, China

² Anhui Engineering Technology Research Center of Biochemical Pharmaceuticals, Bengbu medical college, Anhui, 233030, China

*E-mail: jjarl2009@163.com

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The preparation of amines from amides is an important reaction that is widely used in pharmaceutical and industrial chemistry. A simple, convenient, and effective method for the selective electrochemical hydrogenation of *N,N*-dimethylformamide (DMF) to trimethylamine (TMA) was developed. The effects of the absence and presence of water, temperature, and scanning rate were discussed regarding the electrocatalytic reduction of DMF using cyclic voltammetry, and the polarization curves at different temperatures also examined. The results indicated that electrochemical hydrogenation of DMF to TMA took place on a copper cathode, with water providing protons for the reaction, that effect changed the basic electrolyte properties, such as viscosity and density, which increased the reaction rate, such that increased reaction temperature improved the copper electrode electrochemical activity. The reduction process for DMF was controlled by diffusion at the reaction site and the diffusion coefficient (D_0) was 1.09×10^{-9} cm/s and the apparent activation energy of DMF reduction using a copper cathode at 21.03 kJ/mol.

Keywords: *N,N*-Dimethylformamide, Trimethylamine, Electro-organic synthesis, Selective hydrogenation

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