Nitrogen-doped carbon as electro-Fenton catalyst for organic compounds

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In the study presented in this paper, we performed a one-batch study on the activities of the oxygen-reduction reaction involving only two electrons and the regeneration of divalent iron in the electro-Fenton process, with the nitrogen-doped carbon as the catalyst. The highly nitrogen-doped carbon material for two-electron oxygen reduction reaction and divalent iron reduction were synthesized by the pyrolysis of ionic-liquid composed of only C, H and N. The activity of divalent iron reduction enhanced with surface carbonyl functional group, which is known to be an active site. The degradation experiment showed that the amount of Fenton reaction drastically increased when double working electrodes were used at the same time, and as a result, the removal efficiency was increased significantly. Based on the physical/electrochemical analysis, the ionic-liquid is a candidate precursor of cathode catalyst for the energy effective electro-Fenton process via in-situ peroxide generation/divalent iron regeneration. The obtained results were successfully applied to the removal of pollutants and trace pharmaceutical compounds.