
Carbon Dots Enhanced Chemiluminescence of Fenton System: Enhancement, Mechanism and Applications

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Abstract

Chemiluminescence (CL) of Fenton system was significantly enhanced by nitrogen doped carbon dots (N-CDs) and investigated in detail. The introduction of N-CDs into the Fenton system obviously improved the H₂O₂ utilization efficiency and drastically enhanced the generation of •OH which resulted in enhanced CL emission from Fenton system. Detailed studies show that the enhanced CL was due to excited N-CDs which was produced through energy and electron transfer processes. Indeed, oxidation by H₂O₂ led to rapid incorporation of oxygen to N-CDs. This mechanism would rely on production of •OH radicals through Fenton reaction. The results clearly indicated the important role of peroxide-induced redox cycling of Fe²⁺/Fe³⁺ in presence of N-CDs. This is interpreted to be due to peroxide-induced autoxidation of Fe²⁺ which will cause back-reaction of the produced Fe³⁺ to Fe²⁺ and vice versa. The CL intensity of system containing Fe²⁺ was higher than Fe³⁺ because the rate of Fe³⁺ reaction was much slower than Fe²⁺ reaction. The CL signal remained constant after sometime due to redox cycling to establish equilibrium, irrespective to any form of iron.

References:

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