

## **Kinetic and Mechanistic Study on the Degradation of Typical Pharmaceutical and Personal Care Products in Water by Using Carbon Nanodots/C<sub>3</sub>N<sub>4</sub> Composite and Ultrasonic Irradiation**

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**Abstract :** PPCPs (pharmaceutical and personal care products) in water, as an environmental pollutant, becomes an issue of increasing concern. Therefore, the techniques for degradation of PPCPs has been a hotspot in water pollution control field. Since there are several disadvantages for common degradation techniques of PPCPs, such as low degradation efficiency for certain PPCPs (ibuprofen and Carbamazepine) this proposal will adopt a combined technique by using CDs (carbon nanodots)/C<sub>3</sub>N<sub>4</sub> composite and ultrasonic irradiation to mitigate or overcome these shortages. There is a significant scientific problem that the mechanism including PPCPs, major reactants, and interfacial active sites is not clear yet in the study of PPCPs degradation. This work aims to solve this problem by using both theoretical and experimental methodologies. Firstly, optimized parameters will be obtained by evaluating the kinetics and oxidation efficiency under different conditions. The competition between H<sub>2</sub>O<sub>2</sub> and PPCPs with HO• will be elucidated, after which the degradation mechanism of PPCPs by the synergy of CDs/C<sub>3</sub>N<sub>4</sub> composite and ultrasonic irradiation will be proposed. Finally, a sonolysis-adsorption-catalysis coupling mechanism will be established which is the theoretical basis and technical support for developing new efficient degradation techniques for PPCPs in the future.

**Keywords :** carbon nanodots/C<sub>3</sub>N<sub>4</sub>, pharmaceutical and personal care products, ultrasonic irradiation, hydroxyl radical, heterogeneous catalysis

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