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Urea-based GQDs with PVA Integration

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Graphene Quantum Dots (GQDs) have emerged as a highly promising class of nanomaterials due to their strong photoluminescence, chemical tunability, and favorable electrochemical properties. In this study, urea-derived GQDs and poly(vinyl alcohol) (PVA)-GQD composites were synthesized through a two step process aimed at enhancing both their optical performance and structural characteristics. First, GQDs were produced using a bottom up synthesis approach to generate uniform nanoscale particles exhibiting stable blue green emission. Subsequently, these GQDs were incorporated into a PVA matrix to form PVA-GQD composites with improved photoluminescent behavior.

The optical properties of the synthesized materials were characterized through UV-Vis absorption and photoluminescence spectroscopy. Additional characterization was conducted using Dynamic Light Scattering (DLS) and zeta potential analysis to evaluate particle size distribution and colloidal stability. Building on these findings, the next phase of the study will involve electrochemical assessment via cyclic voltammetry and electrical impedance spectroscopy. These measurements are expected to provide deeper insight into material quality and guide the identification of optimal applications. Based on preliminary results, we anticipate strong potential for electrochemical applications, with additional utility in optical systems owing to the material's robust photoluminescence.

Academic or Professional Status

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