Ridgehart Technical Data Sheet

Ridgehart Premium Carboxylated Graphene Quantum Dots (GQDs) are high-purity, water-soluble nanomaterials engineered for advanced fluorescence applications. With particle sizes below **10 nm** and a rich surface of carboxyl (–COOH) functional groups, these GQDs deliver strong, stable, and tunable fluorescence, ideal for research, industrial, and biomedical use.

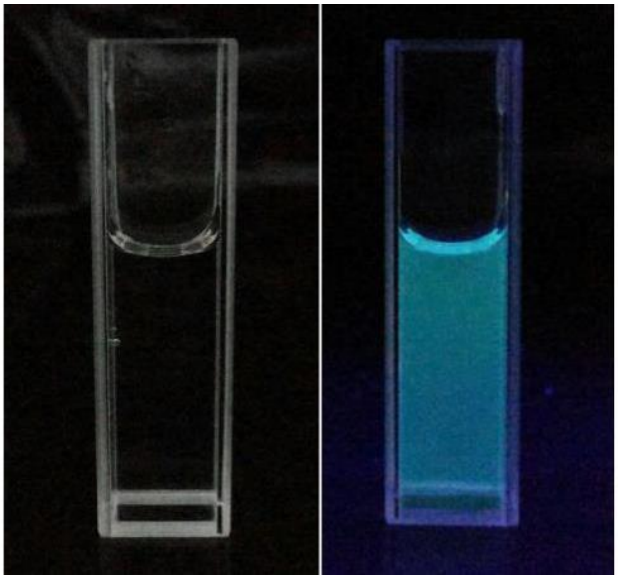


Fig.1 Photos of Carboxyl Graphene quantum dots solution under natural light (left) and at 365 nm UV lamp (right). Note: The concentration of Carboxyl Graphene quantum dots in the photo is >20 mg/mL. This product has low luminescence intensity. If you need graphene quantum dots with strong luminescence, please send an e-mail to info@ridgehart.com. We can recommend a suitable quantum dot according to your experimental needs.

- **Ultra-Small Particle Size (< 10 nm)**: Ensures strong quantum confinement and high photoluminescence efficiency.
- Solvent : Water
- Synthesis Method : Organic synthesis
- Purity : **99.9%**.
- Quantum Yield : 5%.
  Appearance : Pale Yellow Powder
- Light Intensity : Low luminescence intensity, If you need a high intensity version please contact us.
- Carboxyl-Functionalised Surface: Rich –COOH groups improve solubility, reactivity, and compatibility with polymers, biomolecules, and aqueous systems.

- Water-Soluble and Easy to Disperse: Forms stable, clear solutions—ideal for fluorescence composites and bio-labelling.
  Excitation-Dependent Fluorescence: Emission colour varies with excitation wavelength, enabling multi-colour imaging and detection applications.
- High Photostability and Chemical Stability: Maintains fluorescence intensity over long periods and under diverse environmental conditions.
- Environmentally Friendly Composition: Free from heavy metals, research grade safety for lab and industrial applications compared to traditional quantum dots.
- Customizable Options: Available in different concentrations, dispersions. Please contact customer support to discuss.
- Consistent Batch Quality Assurance: Tight size distribution and purity control ensure reproducibility in research and product manufacturing.

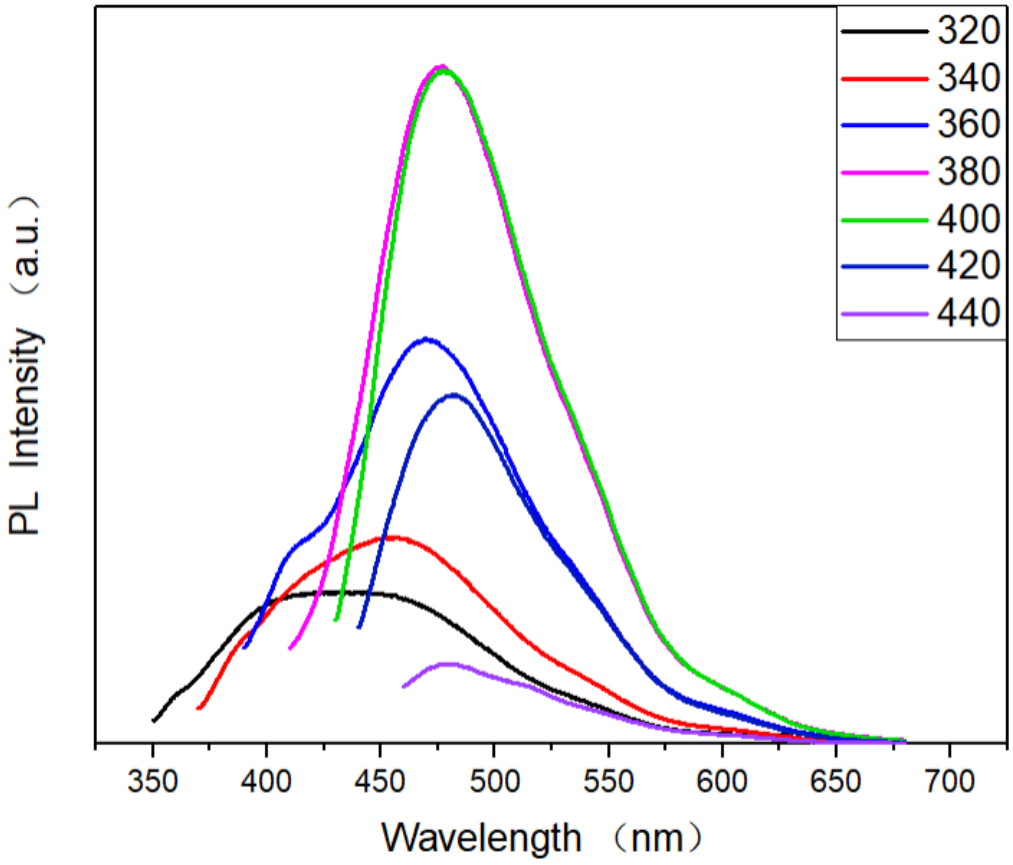


Fig.2 PL spectrum of Carboxyl Graphene quantum dots in water. Note: This spectrum is a single measurement data, allowing floating between different batches.

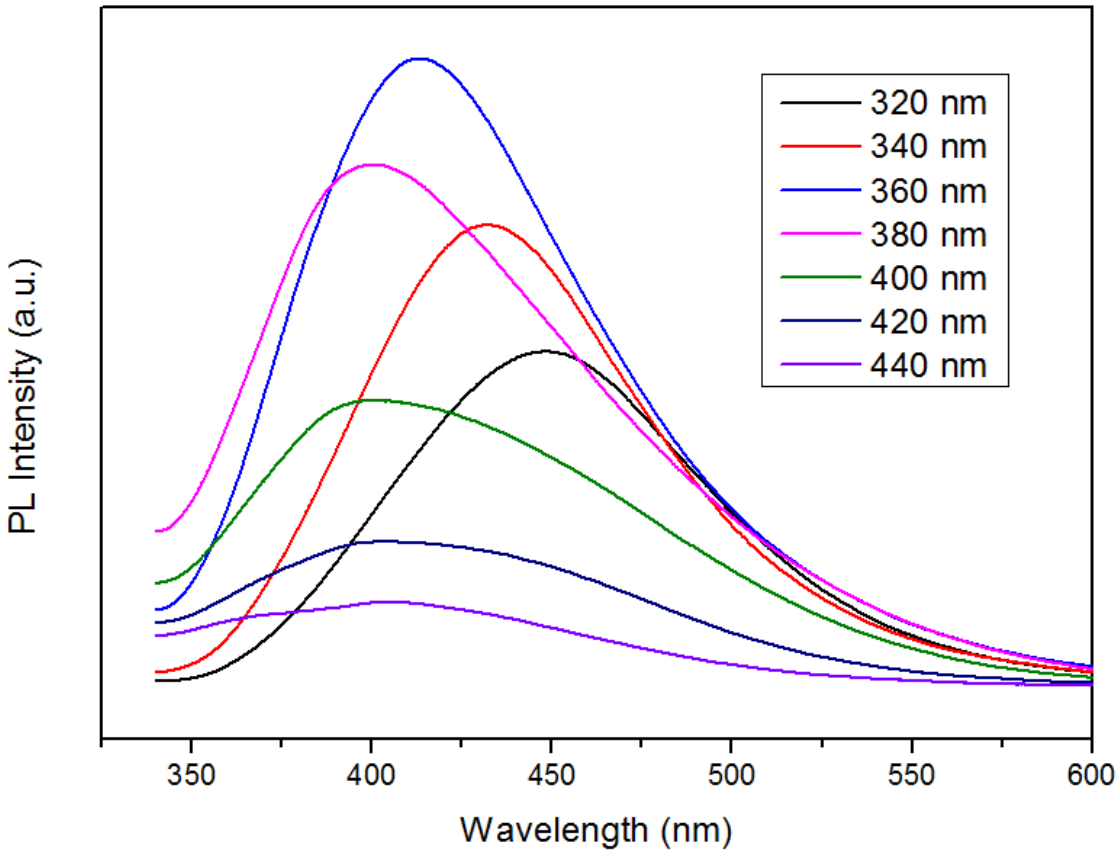
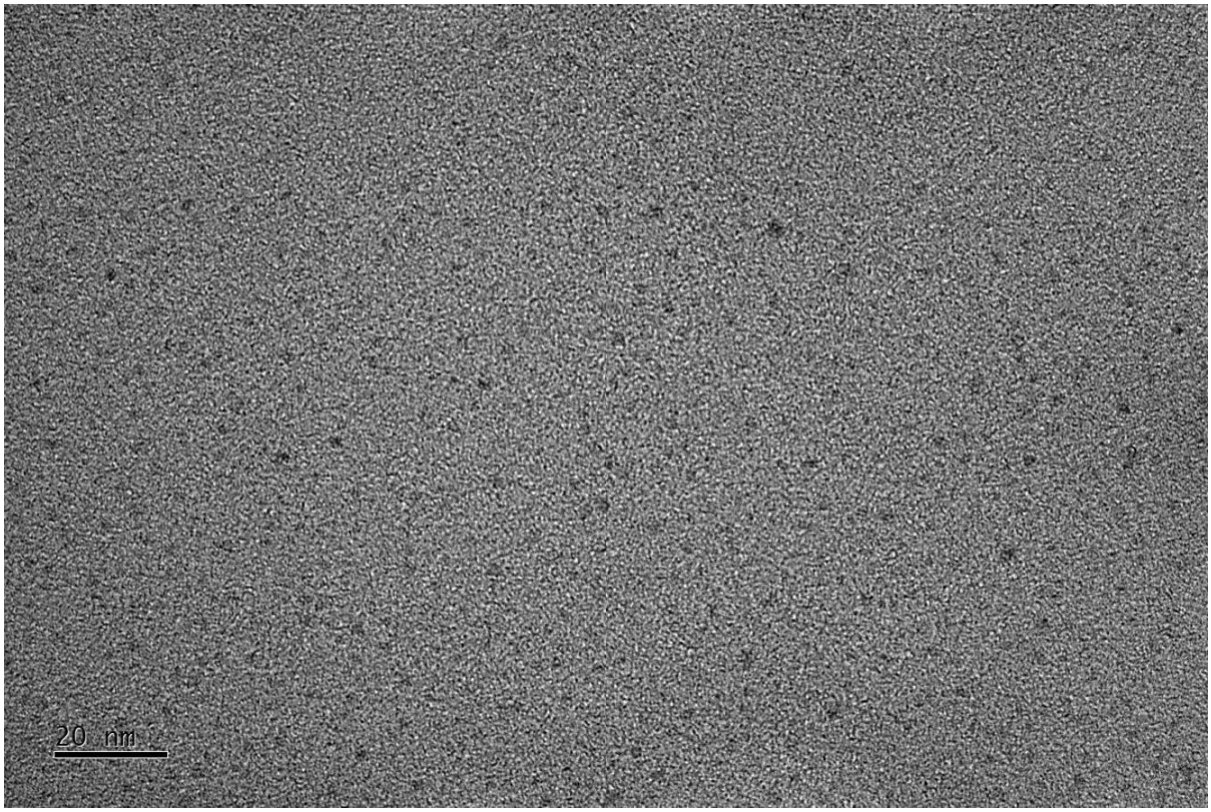


Fig.3 PL spectrum of Carboxyl Graphene quantum dots powder (XF090-1) dispersed in water.
Note: This spectrum is a single measurement data, allowing floating between different batches.


20 nm

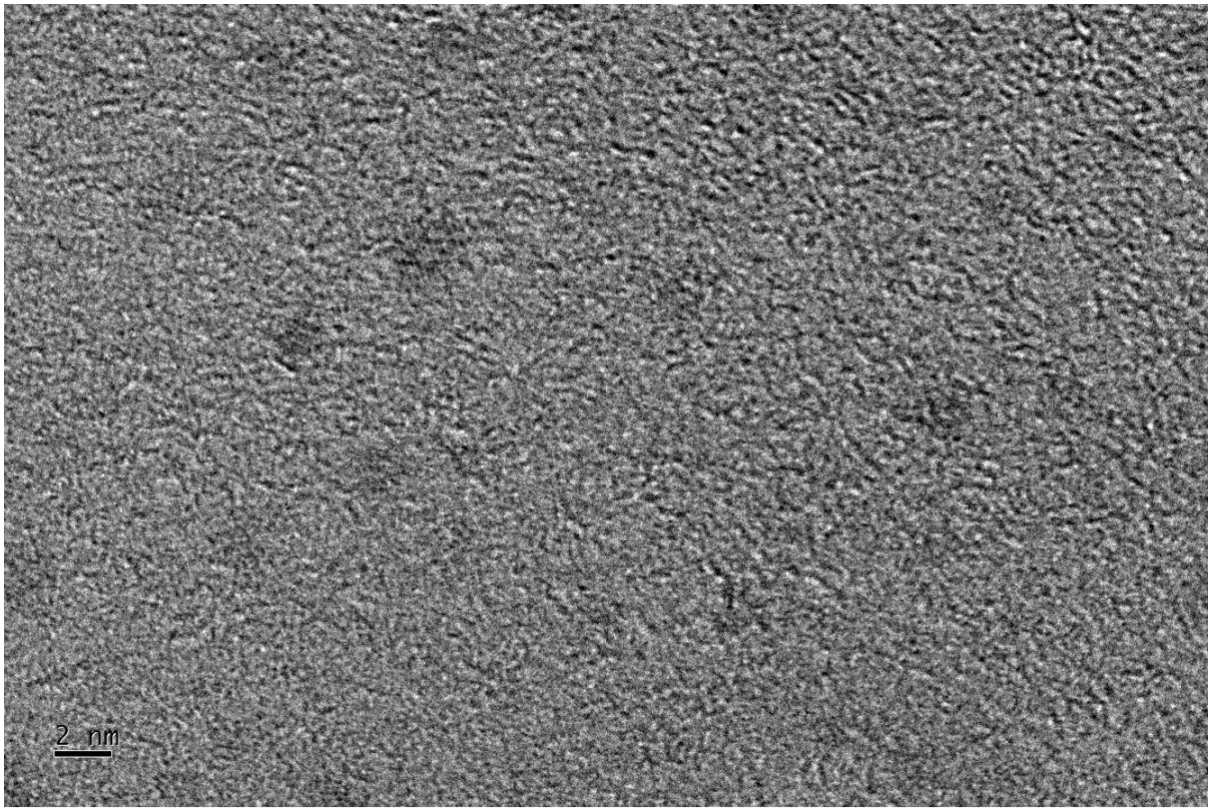

2 nm

Fig.4, 5 TEM of Carboxyl Graphene quantum dots in water

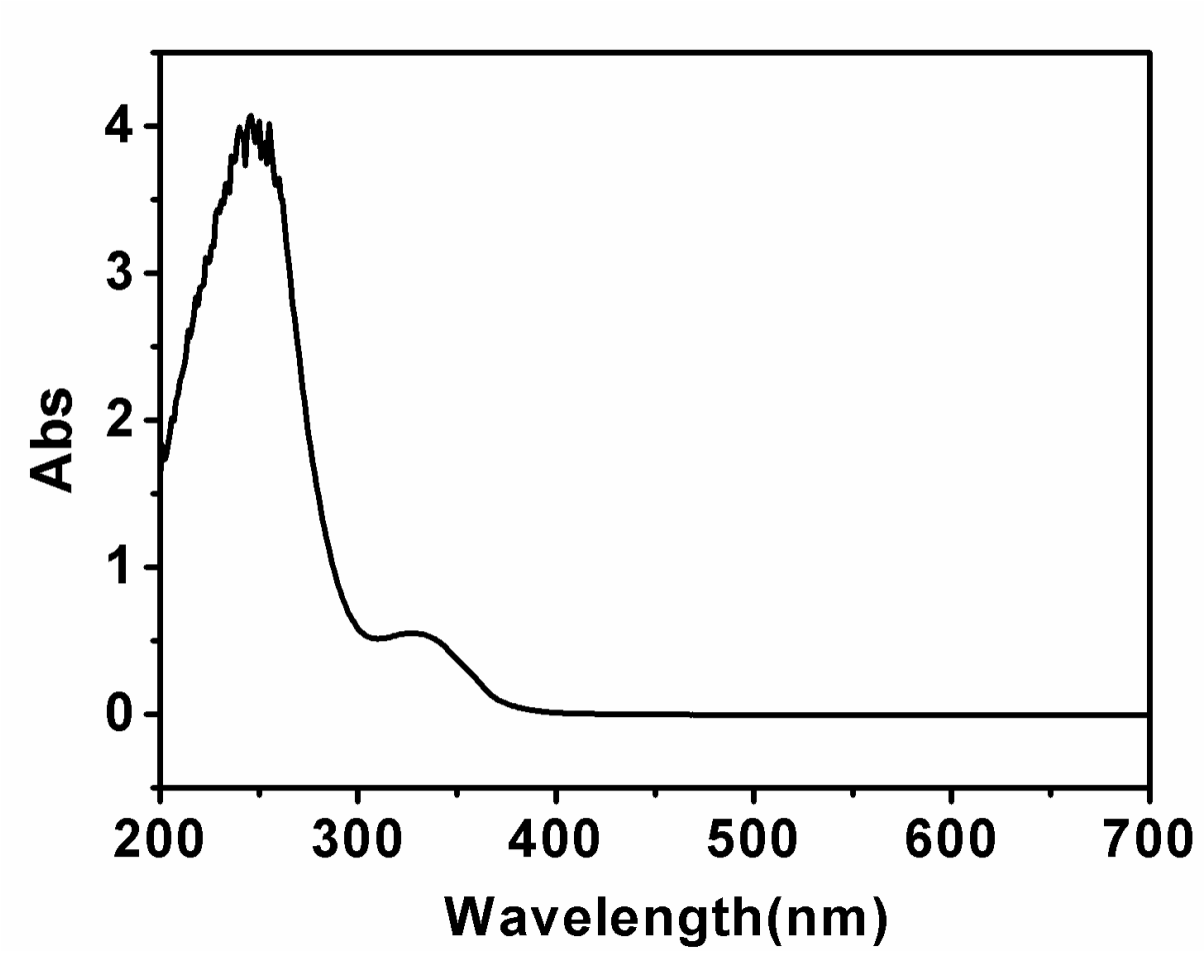


Fig.6 UV-Vis spectrum of Carboxylated Graphene quantum dots in water.

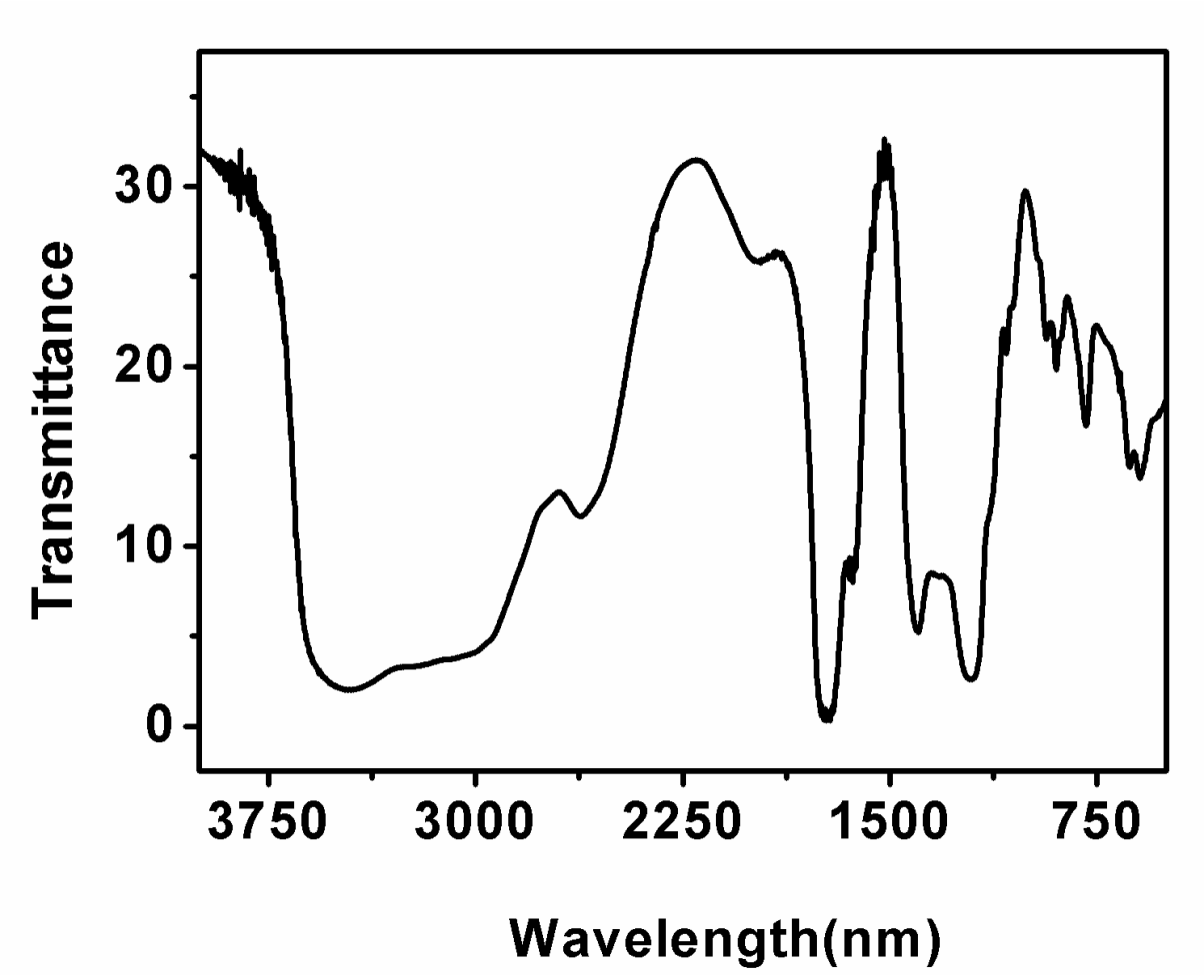


Fig.7 FTIR spectrum of Carboxylated Graphene quantum dots in water.

Key Advantages:

- High aqueous dispersibility and chemical stability.
- Easy bioconjugation with biomolecules (via amide bonds).
- Excellent fluorescence quantum yield and low toxicity.
- Tailorable optical and electronic properties by size and surface chemistry.

Storage Conditions:

The powder should be stored in a dry environment, protected from light, and maintained at ambient low humidity conditions. The powder can be dried in an oven at 60℃ for 30 minutes before use. Recommended shelf life is **3 months** under proper storage once unsealed.
For solution preparation, dissolve the material as required and store the solution at **4 °C**, protected from light, to preserve stability and performance. Recommended shelf life is **3 months** under proper storage once unsealed.

Application Uses:

- **Energy Storage:** Used as additives in supercapacitors, lithium-ion, and sodium-ion batteries, improving charge transfer and electrode stability.
- **Catalysis:** Serve as catalyst supports or active sites for photocatalysis, electrocatalysis (e.g., water splitting, CO_2 reduction).
- **Optoelectronic Devices:** Used in LEDs, photodetectors, and solar cells for light emission and charge transport enhancement.
- **Fluorescent Probes:** Excellent for pH sensing or metal ion detection due to environment-sensitive luminescence.
- **Surface Functionalisation Studies:** Serve as model systems for studying molecular attachment and charge transfer at nanoscale interfaces.
- **Quantum Computing:** As potential qubits due to their tunable band-gap and stable emission.
- **Antibacterial Coatings:** Carboxylated GQDs generate ROS, inhibiting microbial growth on surfaces.

- **Bioimaging and Cell Tracking:** GQDs fluoresce under UV/visible light, allowing labelling and imaging of cells, tissues, and biomolecules.
- Carboxyl groups improve water solubility and biocompatibility, reducing cytotoxicity compared to traditional quantum dots (e.g., CdSe).
- **Drug Delivery:** The carboxyl groups allow covalent attachment of drugs, peptides, or targeting ligands.
- Their small size (~10 nm) facilitates cellular uptake and intracellular transport.
- **Biosensing:** Functionalization enables selective detection of biomolecules (e.g., glucose, dopamine, DNA).
- Fluorescence quenching/turn-on mechanisms make them ideal optical biosensors.
- **Photothermal & Photodynamic Therapy:** GQDs can generate reactive oxygen species (ROS) or heat under light irradiation, useful for cancer therapy.
- **Sensing and Detection:** Detect heavy metals (Pb^{2+}, Hg^{2+}, etc.) or organic pollutants via fluorescence quenching.
- **Photocatalytic Degradation:** Used to break down dyes or pollutants in wastewater under visible light.

Many more application uses, please enquire.

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