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Using Thermolytic Solution of Anionic-decorated Graphene Quantum Dots (GQDs) as Fluorescence Turn on-off Sensor for Selective Screening Test of Metal Ions

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ABSTRACT

This research was aimed to prepare graphene quantum dots (GQDs) by thermolysis of citric acid using paraffin oil bath, preferably regarding weight of citric acid and heating temperature. Fluorescence spectrum of the blue GQDs solution (under UV light), with excitation λ_{max} 365 nm was characterized. The fluorescence intensity at λ_{max} 460 nm was used to calibrate their uniformity. The as-prepared GQDs were achieved with 0.25 g citric acid at 225 °C for 5 minutes. The GQDs solution at pH 6-13 gave high fluorescence intensity without any effect of ionic strength and masking agent. Effect of some anionic salts using their corresponding mineral acids (1%, w/w) to decorate the GQDs was investigated. The results showed that each of HCl, HNO_3 and H_3PO_4 enhances its fluorescence intensity of the GQDs decorated with Cl^-, NO_3^-& PO_4^{3-}, respectively, while the matrix effect of ClO_4^-, SO_4^{2-} and BO_3^{3-} gave very large extent of the quenching effect compared with that of bare GQDs. In addition, these anionic – decorated GQDs were applied for selective screening test with various metal ions. It was found that each kind of these anions shows strong intrinsic quenching and enhancing of their fluorescence intensity of the GQDs, suggesting further trends in their fluorescence determination of some metal ions.

Keywords: Fluorescence sensor, Metal ions, Graphene quantum dots, Thermolysis, Citric acid, mineral acids

INTRODUCTION

It is well known that graphene has found widespread applications in many diverse elds in physics, chemistry, material science, and biology. It has been shown that when a graphene sheet is small enough, its properties can vary signicantly. At a size less than 100 nm, a new kind of materials