FLUORESCENCE DETECTION FOR AQUEOUS NITRITE WITH CARBON DOTS PROBE

Haitao Lin¹, Liyun Ding¹, Bingyu Zhang¹, Jun Huang¹

¹National Engineering Laboratory for Fiber Optic Sensing Technology, Wuhan University of Technology, Wuhan, 430070, China

Nitrite occurs naturally in the environment and plays an important role in the nitrogen cycle. Meanwhile, it has been widely used in the fields of agriculture and food industry. However, the use of nitrite is restricted in physiological systems because of its toxicity, the overdose of which may lead to the haemoglobin oxidation in blood and the formation of carcinogenic nitrosamines in stomach, and cause esophageal cancer, blue baby syndrome and so on. Therefore, the determination of aqueous nitrite is essentially required for reducing the related health risks.

There are several methods for nitrite detection based on UV-vis absorbance, electrochemistry (such as conductimetry and amperometry), fluorescence, and chemiluminescence (CL). Among these methods, fluorometry methods are superior because of high sensitivity, selectivity, time efficiency and the possibility of performing real-time analysis. Carbon dots, the nanoscale particles that are subject to the quantum-confinement effect, have excellent biocompatibility, non-toxicity, and stable photoluminescence (PL). They can be used in many fields such as bioimaging, biosensing, nanomedicine.

In this paper, a fluorescent carbon dots probe for aqueous nitrite detection was synthesized by a one-pot hydrothermal method. The characteristics of carbon dots were studied by transmission electron microscope, X-ray diffractometer, UV-Vis absorption spectrometer and fluorescence spectrophotometer. The fluorescence of carbon dots was quenched by aqueous nitrite, which was attributed to the interaction between the electron-donating functional groups in the surface of the carbon dots and the electron-accepting nitrous acid. The products of the hydrolyzation of aqueous nitrite could perform the stronger quenching on the fluorescence of carbon dots at lower pH. The Stern-Volmer equation (\( \frac{I_0}{I} - 1 = 0.046Q \)) was introduced to describe the relation between the relative fluorescence intensity of the carbon dots and the concentration of nitrite, and a fine linearity (\( R^2 = 0.99 \)) had been found.

**Keywords:** fluorescence detection, carbon dots, aqueous nitrite

**Presenting author’s email:** dlyw@whut.edu.cn