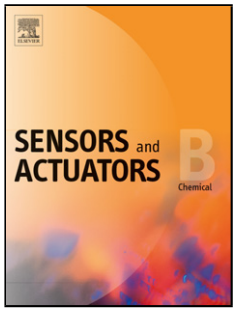

Title: A carbon dot-based fluorescence method for selective quantification of sulfide in environmental samples

Authors: Alireza Abi, Ghasem Kazemi, Afsaneh Safavi

PII: S0925-4005(18)31587-9
DOI: https://doi.org/10.1016/j.snb.2018.08.150
Reference: SNB 25298

To appear in: *Sensors and Actuators B*

Received date: 16-4-2018
Revised date: 11-8-2018
Accepted date: 28-8-2018

Please cite this article as: Abi A, Kazemi G, Safavi A, A carbon dot-based fluorescence method for selective quantification of sulfide in environmental samples, *Sensors and amp; Actuators: B. Chemical* (2018), https://doi.org/10.1016/j.snb.2018.08.150

A carbon dot-based fluorescence method for selective quantification of sulfide in environmental samples

Alireza Abi, Ghasem Kazemi and Afsaneh Safavi*

Department of Chemistry, Faculty of Sciences, Shiraz University, Shiraz 7194684795, Iran

∗ Corresponding author

E-mail address: safavi@susc.ac.ir, and afsaneh_safavi@yahoo.com

Highlights

- A fluorescence-based method for analysis of sulfide is presented.
- The method shows high selectivity and sensitivity toward sulfide.
- The applicability of the method was demonstrated via analysis of real samples.

Abstract

With the rapid growth of agricultural and industrial sectors, a significant quantity of sulfide is released into water resources systems at an increasing rate. This has caused serious environmental problems, which calls for the development of sensitive and selective methods for determining sulfide in environmental samples. In this report, we employed carbon dots (C-dots) as fluorescence emitters and measured the decrease in their fluorescence intensity caused by Ag_2S formation. Instead of having free Ag^+ cation (which can interact with many other species besides sulfide) in the C-dot solution, we used iodide (I^-) to convert Ag^+ to one of the least soluble silver salts (i.e., AgI). While AgI interacts with sulfide to form Ag_2S (because of the lower solubility of Ag_2S), it remains stable against many other anions, thereby offering the method high selectivity. Under optimized experimental conditions, the developed method enabled quantifying sulfide in the range of 1 to 10 µM with the low detection limit of 0.48 µM. The applicability of the method was demonstrated by successful analysis of sulfide in a mineral water, a hot spring water, and an industrial wastewater sample.

Keywords: Carbon dot; Fluorescence method; Sulfide detection; Silver iodide; Sensing

1 Introduction

Hydrogen sulfide (H_2S) is a highly toxic gas, exposure to high concentration of which can cause a range of adverse health effects [1]. In nature, the gas is found in places where the breakdown of organic matter takes place under low oxygen conditions, such as volcanoes, swamps, sulfur springs, hydrocarbon deposits, and stagnant bodies of water [2]. H_2S is released into the environment also through industrial activities and can be found near oil and gas processing sites, geothermal power plants, tanneries, and pulp/paper mills. In aqueous media, H_2S dissociates into hydrosulfide (HS^-) and