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Abstract

Low-Cost, High-Sensitivity Detection of Waterborne Al^{3+} Cations and F^- Anions via the Fluorescence Response of a Morin Derivative Dye †

Alhulw H. Alshammari [1,2,*], Zahrah Alqahtani [1], Faiz Bukhari Mohd Suah [3], Syaza Atikah Nizar [3], Alan Dunbar [4] and Martin Grell [1]

1 Physics and Astronomy, University of Sheffield, Hicks Building, Hounsfield Rd, Sheffield S3 7RH, UK; zjalqahtani1@sheffield.ac.uk (Z.A.); martin@spinne.plus.com (M.G.)
2 Physics Department, College of Science, Jouf University, P.O. Box 2014, Sakaka 72311, Saudi Arabia
3 Chemical Sciences, Universiti Sains Malaysia USM, Penang 11800, Malaysia; fsuah@usm.my (F.B.M.S.); syazarockabout93@gmail.com (S.A.N.)
4 Chemical and Biological Engineering, University of Sheffield, Mappin St, Sheffield S1 3JD, UK; a.dunbar@sheffield.ac.uk
* Correspondence: ahalshammari@ju.edu.sa
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Abstract: Morin dye is known as a cheap and readily available selective 'off → on' fluorescent sensitiser when immobilised in a phase transfer membrane for the detection of Al^{3+} ions. Here, a morin derivative, NaMSA, which readily dissolves in water with good long-term stability is used in conjunction with a fibre-optic transducer with lock-in detection to detect Al^{3+} in drinking water below the potability limit. The combination of a water-soluble dye and the fibre-optic transducer require neither membrane preparation nor a fluorescence spectrometer yet still display a high figure of merit. The known ability to recover morin-based Al^{3+} cation sensors selectively by exposure to fluoride (F^-) anions is further developed, enabling a complementary sensing of either fluoride anions, or aluminium cations, using the same dye with a sub-micromolar limit-of-detection for both ions. The sensor performance parameters compare favourably to prior reports on both aqueous aluminium and fluoride ion sensing.

Keywords: morin; aluminium; fluoride; fibre optics

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