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Novel colorimetric sensors for cyanide based on azo-hydrazone tautomeric skeletons



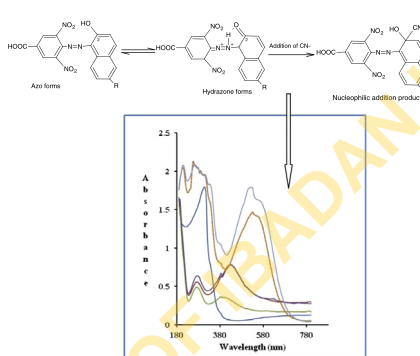
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HIGHLIGHTS

- Azo-hydrazone tautomeric switch detected CN.
- Bathochromic shift produced.
- CN detected at low levels.
- Simple methods developed.

GRAPHICAL ABSTRACT



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ABSTRACT

The monoazo dyes, 4-carboxyl-2, 6-dinitrophenylazohydroxynaphthalenes dyes (AZ-01, AZ-03 and AZ-04), were evaluated as a highly selective colorimetric chemosensor for cyanide ion. The recognition of cyanide ion gave an obvious colour change from light yellow to brownish red and upon dilution with acetone produced a purple to lilac colour.

Optimum conditions for the reaction between the azo dyes and cyanide ion were established at 30 °C for 5 min, and different variables affecting the reaction were carefully studied and optimised. Under the optimum conditions, linear relationships between the CN⁻ concentrations and light absorption were established. Using these azo-hydrazone molecular switch entities, excellent selectivity towards the detection of CN⁻ in aqueous solution over miscellaneous competitive anions was observed. Such selectivity mainly results from the possibility of nucleophilic attack on the azo-hydrazone chemosensors by cyanide anions in aqueous system, which is not afforded by other competing anions.

The cyanide chemosensor method described here should have potential application as a new family probes for detecting cyanide in aqueous solution.

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Introduction

Colorimetric sensors have become very popular in recent years due to their capability to detect and in some instances to semi-quantitate analyte by naked eye detection without resorting

to expensive instrumentation [1]. The colorimetric chemosensors are therefore considered as one of the most effective analytical method for environmental monitoring [2–6], particularly detection of major cationic and anionic species whose presence in the environment have deleterious consequences.

Cyanides are naturally occurring substances found in a number of foods and plants and produced by certain bacteria, fungi, and algae. Cyanide can enter the environment as a result of both natural and industrial processes [7]. The primary source of cyanide

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