

# ABSTRACT

INDEX NO. 55/17/Chem./25

## Fluorometric detection of industrially important small molecules and metal ions using phenol-based probe molecules with applications in real samples

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This thesis represents some fluorescence techniques towards analytical detection of different environmentally important metal ions and small molecules which possess serious effects on our health. We have designed some simple phenol based fluorescent probes. The thesis consist of five chapters which are outlined below:

**Chapter 1** includes theoretical and technical features of fluorescence spectroscopy as well as general approaches towards designing of fluorescence sensors. It also includes literature overview on some chemo-sensors based on phenolic moiety. Furthermore, it discussed previous studies in brief related to fluorometric detection of  $Al^{3+}$  and small molecules like water and methanol using different fluorescent probes.

**Chapter 2** describes the materials and experimental methods for whole thesis work. It also describes the synthesis protocols of different fluorescent probes along with their characterization methods. Further the detail procedures for preparation of various analytical samples are included.

**Chapter 3** highlights a convenient fluorometric procedure for the detection of soluble  $Al^{3+}$  in alcohol medium using a newly synthesized phenolic Schiff base molecule containing coumarin moiety as aluminium fluorosensor. The probe is operable in alcohol medium for early stage detection of micro-level alcoholate corrosion in terms of fluorometrically soluble aluminium alkoxide. Simultaneous monitoring of wet and dry corrosion facility is utilized to identify the alcoholate corrosion in its embryonic stage for commercial aluminium alloy.

**Chapter 4** reports a very simple fluorescence probe method for the detection of trace moisture in polar aprotic solvents using a diformyl phenol derivatives. The probe exhibits water induced spectral blue shift in the UV-vis absorption spectra. Such spectral changes causes water% dependent linear emission intensity response which is utilized for the detection of moisture ratiometrically. The method due to its detection simplicity can be applied to detect water adulteration in different food stuffs.

**Chapter 5** highlights a unique fluorescence method for detection of trace amount of methanol in ethanol and isopropanol medium using  $Al^{3+}$ -complexes of phenolic Schiff base. The detection is mediated by the presence of various extent of water in the medium. Thus, we have shown that the method is very useful to detect methanol poisoning in different alcoholic beverages and hand sanitizers containing high water background.

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12/5/22

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12/05/2022