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Antipyrine Derived Schiff Base: A Colurimetric Sensor for Fe(III) and “Turn-On” Fluorescent Sensor for Al(III)

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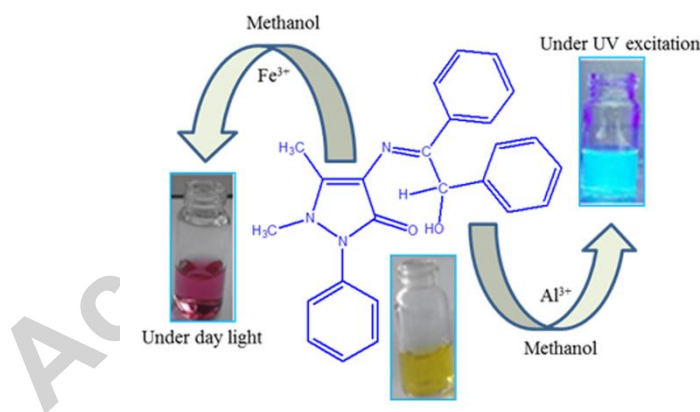
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Abstract

A new Schiff base, 1,5-dimethyl-4-(2-hydroxy-1,2-diphenylethylideneamino)-2-phenylpyrazol-3-one (L) was synthesized by the condensation of 4-amino-2, 3-dimethyl-1-phenyl-3-pyrazolin-5-one (4-aminoantipyrine) with 2-hydroxy-1,2-di(phenyl)ethanone (benzoin). It was characterized by elemental analysis and spectroscopic techniques. The optical response of the compound, L towards various metal ions like Fe^{3+} , Co^{2+} , Ni^{2+} , Cu^{2+} , Zn^{2+} , Al^{3+} , Mg^{2+} , Ca^{2+} , Ba^{2+} , Pb^{2+} , Cd^{2+} and Hg^{2+} was monitored in methanolic solution. L showed a remarkable colourimetric response towards Fe^{3+} and fluorescence “turn-on” behavior towards Al^{3+} . Binding with Fe^{3+} induces a “naked-eye” purple coloration under day light. The recognition of L with Al^{3+} is responsible for blue fluorescent emission at 463 nm. The UV-Visible and fluorescent spectral studies of L with different metal ions were consistent with the visual observation. Due to the transient nature of the complex formed between L and Fe^{3+} in methanolic solution, the stability of the complex formed in an aprotic solvent, acetonitrile was also ascertained. The stoichiometry and association constant of the complex formed were calculated.

Graphical Abstract



Keywords: Schiff base, 4-Aminoantipyrine, Colourimetric, Fluorogenic, Metal ions.

1. INTRODUCTION

Design and synthesis of simple organic molecules for selective detection of metal ions have considerable importance in the present scenario. This method of detection has several advantages such as simplicity, selectivity, low cost, rapid and real-time monitoring, visual detection etc. [1-3]. Previously adopted techniques for the detection of metal ions like, atomic absorption spectrometry [4], chromatography [5], plasma emission spectrometry [6], ion

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