COLORIMETRIC CHEMORECEPTORS FOR DIFFERENT METAL IONS: A SHORT COMMUNICATION

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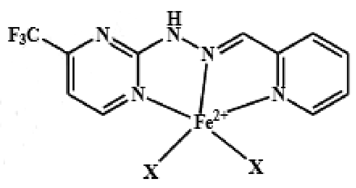
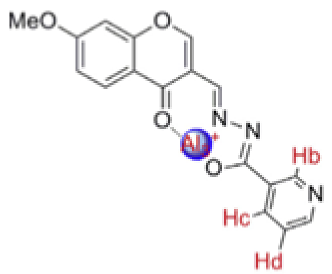
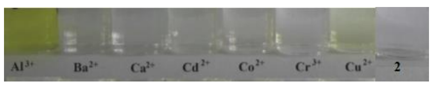
Abstract: Colorimetric chemosensing is best method of sensing because of through naked eye detection. Colorimetric chemoreceptors were preferred over other chemoreceptor due to their several advantages such as, easy detection, no complex procedures and high selectivity and sensitivity. In colorimetric chemosensing, the coordination site binds the metal (guest) in such a way that signalling unit displays the change in color. The crucial roles of the metal ions in the biological, environmental, and industrial processes, the recognition and sensing of them is growing and has attracted much interest in molecular recognition studies in recent years. In this short communication, we have focused on colorimetric chemoreceptor for different metal ions.

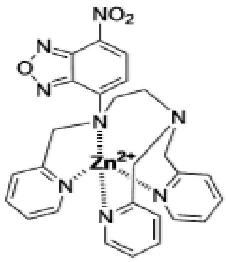
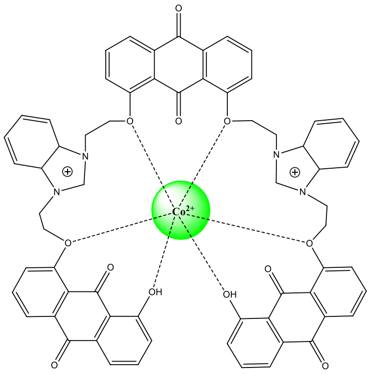
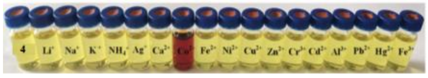
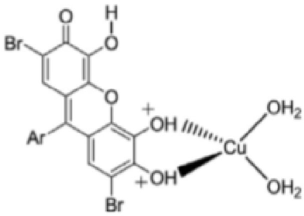
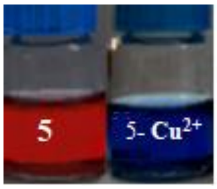
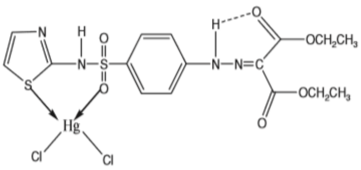
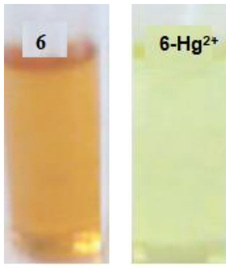
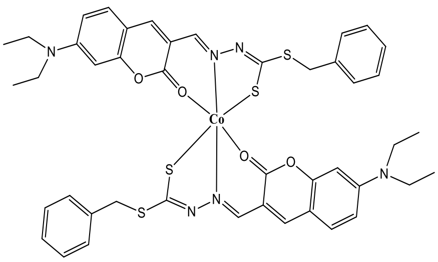
***Keywords* - Chemoreceptor, colorimetric, naked-eye, metal ion.**

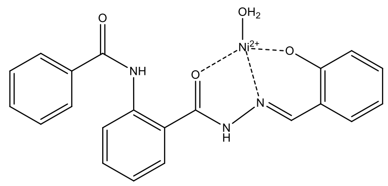
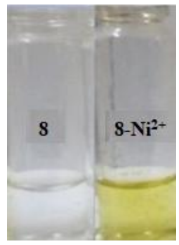
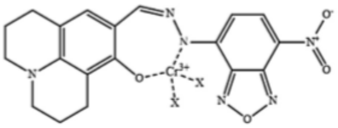
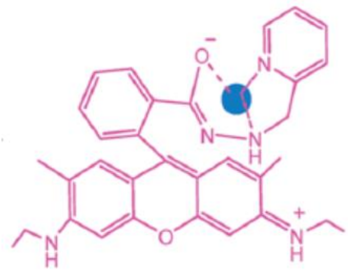
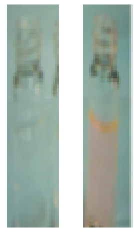
I. INTRODUCTION

In the host guest chemistry, the term chemoreceptor is clearly associated with a molecular event. Receptor is a system that on stimulation by any form of energy changes its own state and also one or more of its characteristics [1]. This change shows the stimulant both qualitatively and quantitatively. These receptor molecules exhibit particular response to specific ions or neutral species to be used as chemoreceptor. Numerous metal ions find common use in environmental chemistry, medical diagnostics, and physiological catalysis [2,3]. Colorimetric procedures can conveniently and easily monitor target ions with the bare eye [4–7]. Colorimetric procedures have therefore attracted considerable attention regarding the detection of toxic metal ions. Although most of these procedures require a complicated sample preparation procedure, trained operators and elaborate equipment they have their own qualities such as sensitivity, simplicity and real-time monitoring with a fast response time. Meanwhile, colorimetric methods can conveniently and easily detect target ions with the naked eye without expensive equipment [8–12].

II. COLORIMETRIC CHEMORECEPTORS FOR METAL IONS

Chemoreceptors-Analyte binding mode	Reason	Color change
1. 	Chemoreceptor 1 showed the selective response to Fe^{2+} by displaying a colour changes from colourless to light pink. The binding ratio is 1:1 between Fe^{2+} and receptor 1. The receptor can be utilized for checking Fe^{2+} ions in drinking water and environmental sample [13].	 **1 1-Fe^{2+}**
2. 	This chemoreceptor 2 could be used as probe for Al^{3+} in ethanol and the changes observed in visible light region at (433 nm) and emission (503 nm). Receptor 2 can also be used as a colorimetric chemoreceptor for Al^{3+}, which is easily observed from colorless to yellow–green by the naked-eye. The binding ratio between chemoreceptor 2 and Al^{3+} is 1:1. [14]	

3. 	Chemoreceptor 3 showed a very selective sensing for Zn^{2+} in the presence of other competitive metal ions in aqueous medium. On addition of receptor 3 with Zn^{2+}, 1:1 binding mode is formed. [15].	
4. 	The chemoreceptor 4 and the cobalt ion interaction forming the compound which senses the cobalt ion with a hypochromic shift and a new peak at 487 nm were observed. The absorption band confirms the formation of 1:1 (host/guest) stable complex with Co^{2+} [16].	
5. 	1:1 binding ratio is observed between chemoreceptor 5 and Cu^{2+}. The visible spectrum of the sensor 10 in DMSO/H_2O is characterized by two main bands at about 416 and 523 nm. The presence of Cu^{2+} induced a red shift from 523 to 587 nm which resulted in a color change of the solution from red to dark blue [17].	
6. 	The interaction of chemoreceptor 6 with Hg^{2+} may be understood by its soft nature. The coordination between receptor 6 and Hg^{2+} is further explained by bathochromic shifts of 8nm and 2nm in 307nm and 396 nm adsorption bands respectively upon interaction of chemoreceptor 2 with Hg^{2+} ions [18].	
7. 	The retention band range of chemoreceptor 7 shows a visible band at 473nm. Within the sight of cobalt, the band at 473 nm was weakened while another band showed up at longer wavelength 517nm. After the host guest binding, a red shift observed which results in a color change from yellow to red [19].	

8. 	Colorimetric chemoreceptor 8 can detect Ni^{2+} ions in aqueous solution.On the addition of Ni^{2+} to receptor 4, nickel ions produce a complex, tetra-coordinated, chelating with oxygen of salicylaldehyde, Nitrogen of imino,oxygen of amido and H_2O molecule. This coordination was confirmed by ESI-MS studies [20].	
9. 	Chemoreceptor 9 is having NBD (7-nitrobenzo-2-oxa-1,3-diazolyl) and julolidine moieties. These moieties are attached through Schiff base. With addition of Cr^{3+} ions to chemoreceptor 9 shows color change from violet to blue colour and the absorption band confirms the binding mode of host/guest stable complex is 1:1 [21].	 9 9-Cr^{3+}
10. 	Upon the gradual addition of Cu^{2+} to the solution of chemoreceptor 10, a new absorption peak at 529 nm emerged with increasing intensity, and the solution displayed a clear change from colorless to orange simultaneously, which can be ascribed to variation from a spirocyclic form to a ring-opened amide form [22].	 10 10-Cu^{2+}

III. Conclusion

In this short communication, a number of studies targeting on the development of colorimetric chemoreceptor for different metal ion are covered. The colorimetric chemosensng is the low-cost method to detect the presence of different metal ion in system. The receptors were displaying signal by colorimetric chemosensing due to chemical process. These chemoreceptors in different solvents showed specific activity for different metal ions. In colorimetric chemoreceptor, this is the an obvious color change starting with one color to different other colors was observed by means of naked eyes. Binding ratio between chemoreceptor and metal ion could be 1:1, 2:1 or 1:2 due to formation of stable complex.

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