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Acid-Base Responsive Probes for Mercury(II) Ions in Aqueous Solution

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Abstract

A simple ratiometric optical method for mercuric ion sensing has been developed using an ensemble of an indicator, such as 7-hydroxy-4-methylcoumarin (**7H4MC**) and bromothymol blue (**BTB**), and a receptor, such as N,N-bis(p-methoxybenzyl)-3,6-dioxaoctane-1,8-diamines (**bis-pMDODA**) and cryptand [2.2.2] (**C222**), in aqueous solution. The equilibrium between indicator and receptor is perturbed by adding Hg^{2+} ions (0.8–80 μM), due to the formation of a receptor-metal complex, resulting in a change of the UV/Vis spectra. Both sensitivity and selectivity are explained in terms of association constants between receptor and metal ions and equilibrium constants of the reaction between indicator and receptor. Indicator bromothymol blue has also presented a color variation from light blue to yellow upon coordination of Hg^{2+} to the receptor, which allows a metal naked-eye detection. The detection limit of the system was found to be about 3 μM and the relative standard deviation for five measurements of 20 μM concentration was 5.6%. **BTB/7H4MC** arrangement showed a particular selectivity over different interfering cations, suffering only interference from Cu^{2+} ions for Hg^{2+} sensing.

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