



Fluorescence sensor array for rapid detection of heavy metal ions

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The use of para-Phenylene vinylene fluorophores in conjunction with principal component analysis (PCA) for rapid detection of copper ions (Cu(II)), lead ions (Pb(II)) and mercury ions (Hg(II)) in drinking water is reported. Fluorescence of the materials in which emission of blue light occurs upon excitation of ultraviolet light is turning off in the presence of metal ions. It is viable to achieve ion selectivity by modifying para-phenylene vinylene with a side-group acting as a metal ion capturing molecule such as aminocarboxilate and aza crown. The fluorescent molecules were found to be sensitive to Cu(I), Cu(II), Ag(I), Pb(II) and Hg(II) with the limit of detection of 10^{-7} - 10^{-5} mol/L in laboratory conditions. In this report, three molecules were introduced as a model system to simultaneously identify Cu(II), Pb(II) and Hg(II) contaminants in deionized water and drinking waters. Fluorescence data were collected using a commercial fluorescence spectrometer in which the limit of detection of 10^{-6} mol/L was achievable, although interference of native ion species in drinking water to a certain extent caused difficulties in interpretation of fluorescence data. This platform could be in principle extended to either specific or multiplex detection of other metal ions by modification of highly selective binding molecule or design of fluorescence array.

Keywords Fluorescence; Sensor array; Heavy metal ions