

Abstract

We report a simple, label free and sensitive detection of lead (Pb_{2+}) ions using liquid crystals (LCs) with a detection limit of 3 nM. The LC-aqueous interface is initially decorated with a positively charged surfactant, CTAB (Hexadecyltrimethylammonium Bromide) which aligns the LC homeotropically through the hydrophobic interactions between LC and CTAB molecules. An ordering transition in LC is registered on the addition of Spinach RNA (SRNA) (from homeotropic to planar) due to interaction of SRNA and CTAB leading to the disruption of the self-assembled monolayer of CTAB. Again, we observed an ordering transition of the LC (from planar to homeotropic) upon contact of Pb_{2+} ions with SRNA-CTAB complexes. The reported system exhibits an excellent detection limit of 3 nM Pb_{2+} ions. This is far below the permissible limit of Pb_{2+} in potable water (72 nM). It also shows high selectivity towards Pb_{2+} over other ions. The system also shows a specificity towards SRNA over other RNA sequences. These properties make the proposed system a promising candidate for Pb_{2+} ion detection in point of care applications.