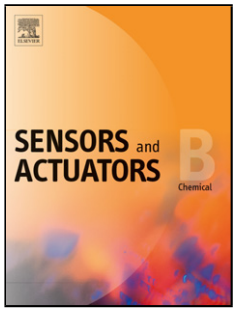


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<AT>Rhodamine based ``turn–on" molecular switch FRET–sensor for cadmium and sulfide ions and live cell imaging study

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<ABS-Head><ABS-HEAD>Graphical abstract
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<ABS-P><xps:span class="xps_Image">fx1</xps:span>
**<ABS-HEAD>**Highlights► A rhodamine-based turn-on fluorescence probe (RBD4) was synthesized and characterized by $^{1}H$ NMR, $^{13}C$ NMR and ESI-MS. ► The X-ray crystal structure analyses exhibit the spirolactone of fluorescent sensor RBD4. ► Highly selective towards $Cd^{2+}$ ion over other metal ions conformed by XRD, SEM, EDAX and FT–IR studies. ► The 1:1 stoichiometric structure between RBD4 and $Cd^{2+}$ were supported by Job's plot, Benesi-Hildebrand plot and DFT theoretical calculations. ► RBD4 fluorescent sensor was used in imaging $Cd^{2+}$ in cultured HeLa cells.

**<ABS-HEAD>Abstract**

<ABS-P>A novel fluorescent chemosensor based on a rhodamine derivative (RBD4) was designed, synthesized, and used as a selective $Cd^{2+}$ ion sensor. The structure of the fluorescence sensor (RBD4) is confirmed through single crystal X-ray study. On the basis of the Förster resonance energy transfer mechanism between rhodamine and pyridine conjugated dyad, a new colorimetric as well as fluorescence probe was synthesized for the selective detection of $Cd^{2+}$. This sensor shows high selectivity towards $Cd^{2+}$ ions in the presence of other competing metal ions. On the basis of thorough experimental and theoretical findings, the additions of $Cd^{2+}$ ions to the solution of RBD4 helps to generate a new fluorescence peak at 590 nm due to the selective binding of $Cd^{2+}$ ions with RBD4 in a 1: 1 ratio with a binding constant (K) of 4.2524 x $10^{4}$ $M^{-1}$. The detection limit of RBD4 for $Cd^{2+}$ was 1.025 × $10^{-8}$ M, which presented a pronounced sensitivity towards $Cd^{2+}$. The *in situ*