Electronic Supplementary Material (ESI) for New Journal of Chemistry.


# Supporting Information

# Development of a Cr(III) ion selective fluorescence probe using organic nanoparticles and its real time applicability

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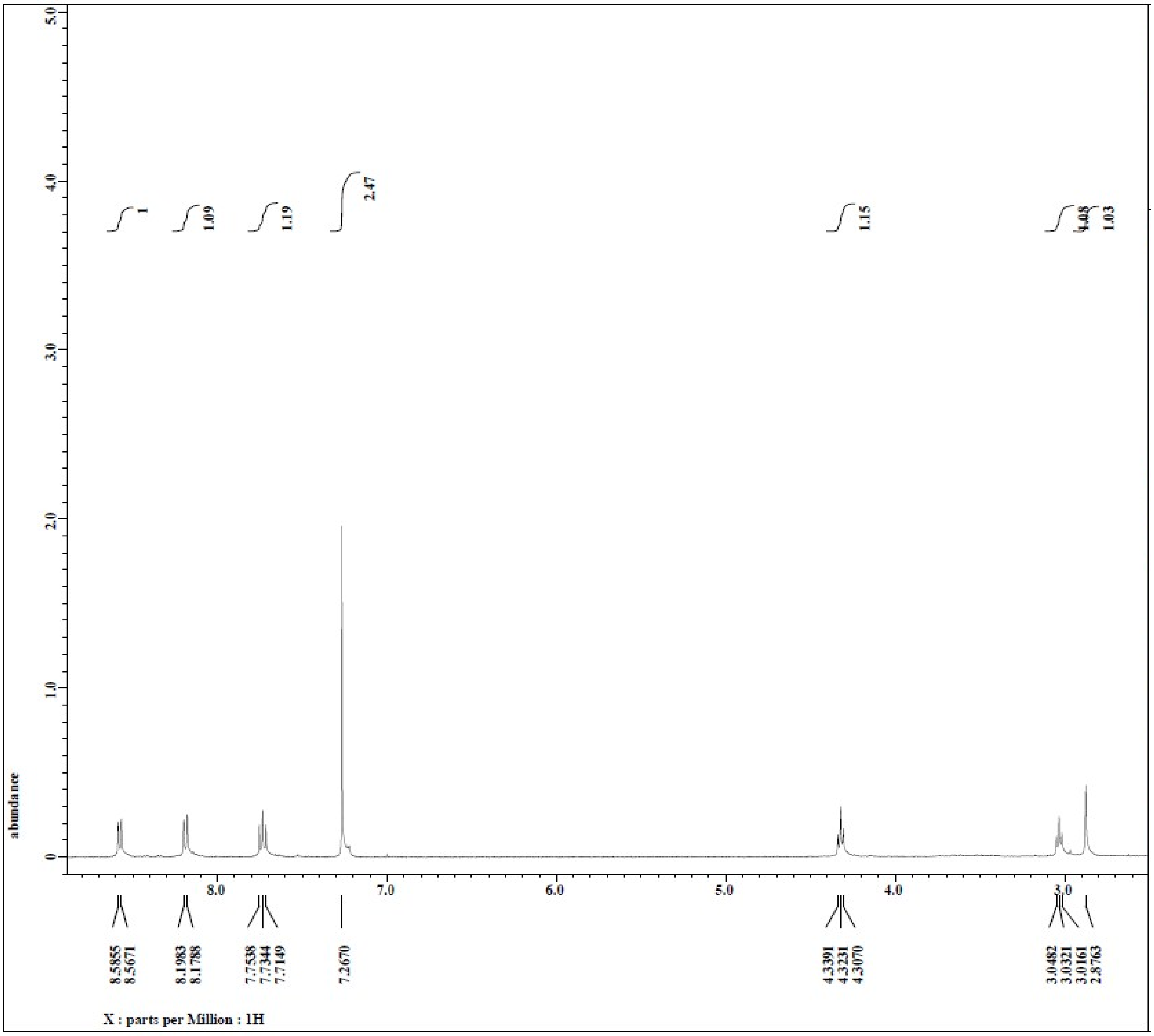


**Figure S1. [1]H NMR spectrum of Ligand 1**

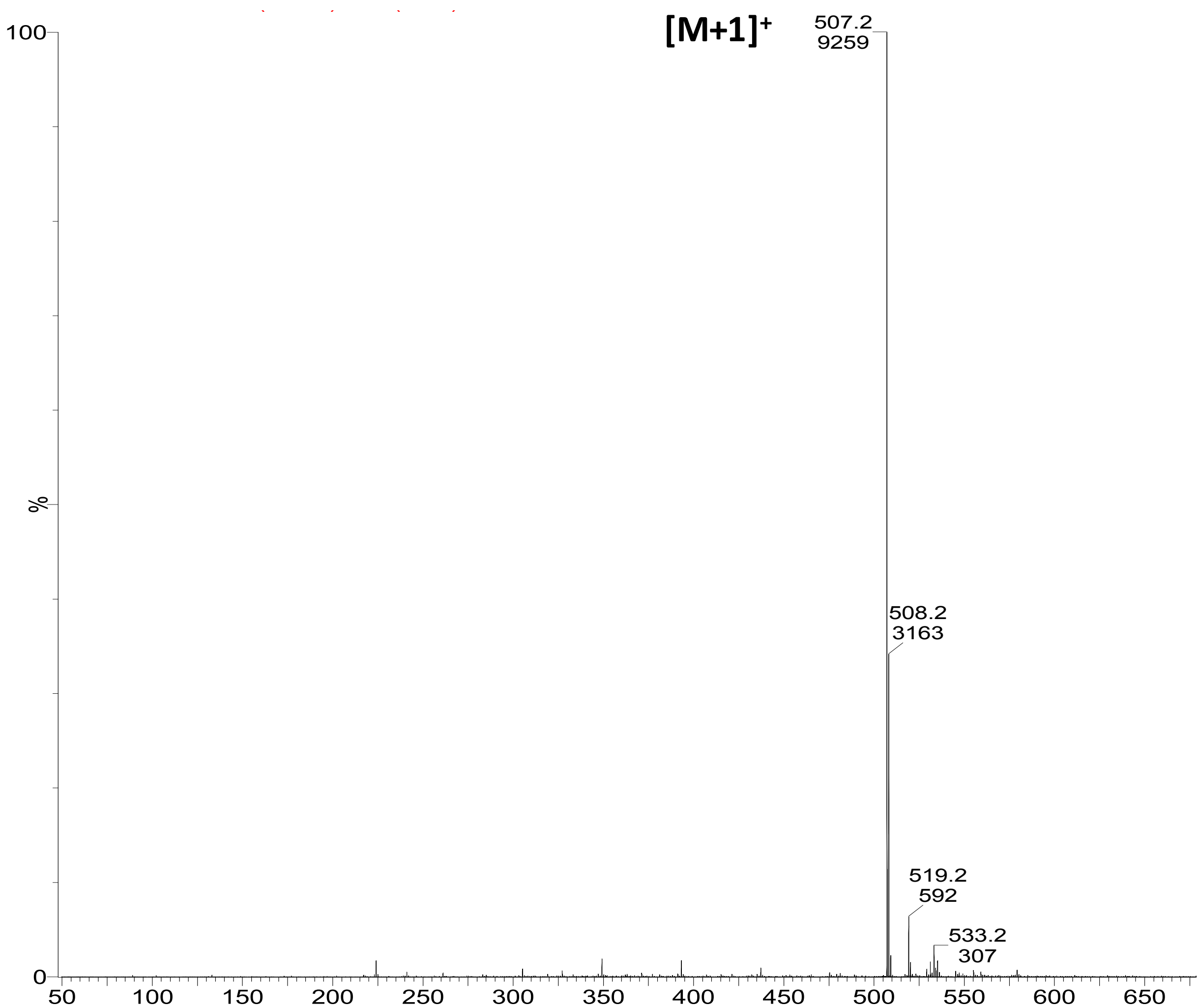


**Figure S2. Mass spectrum of Ligand 1**

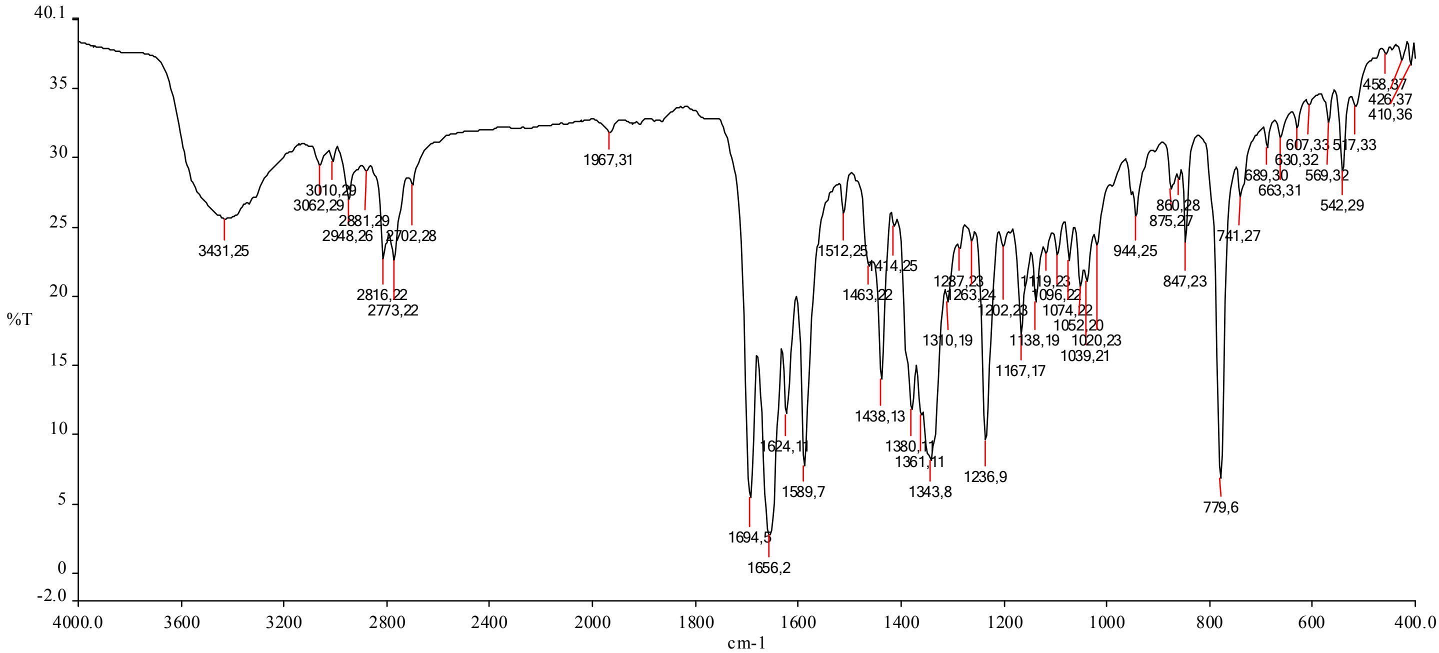


**Figure S3. IR spectrum of Ligand 1**

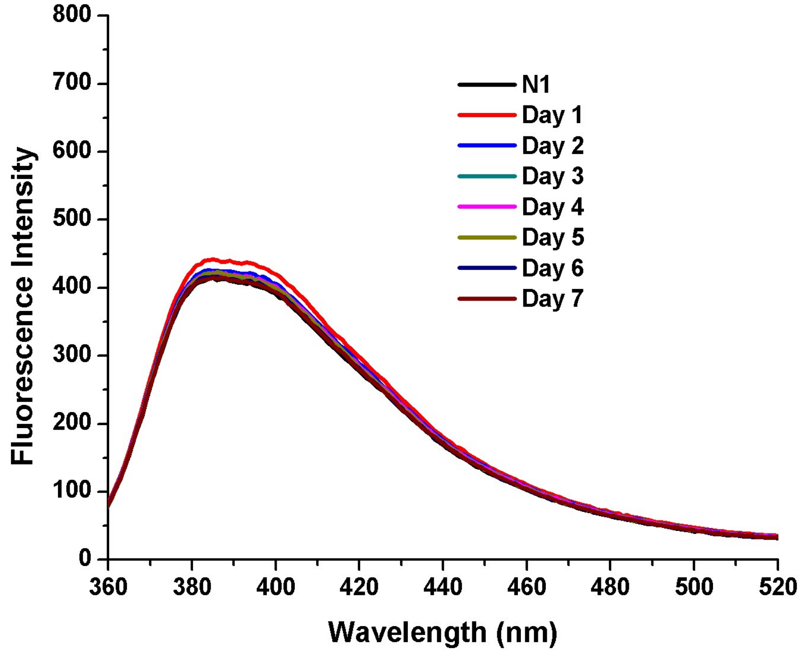


**Figure S4. Fluorescence emission profile showing the stability of organic nanoparticles N1.**

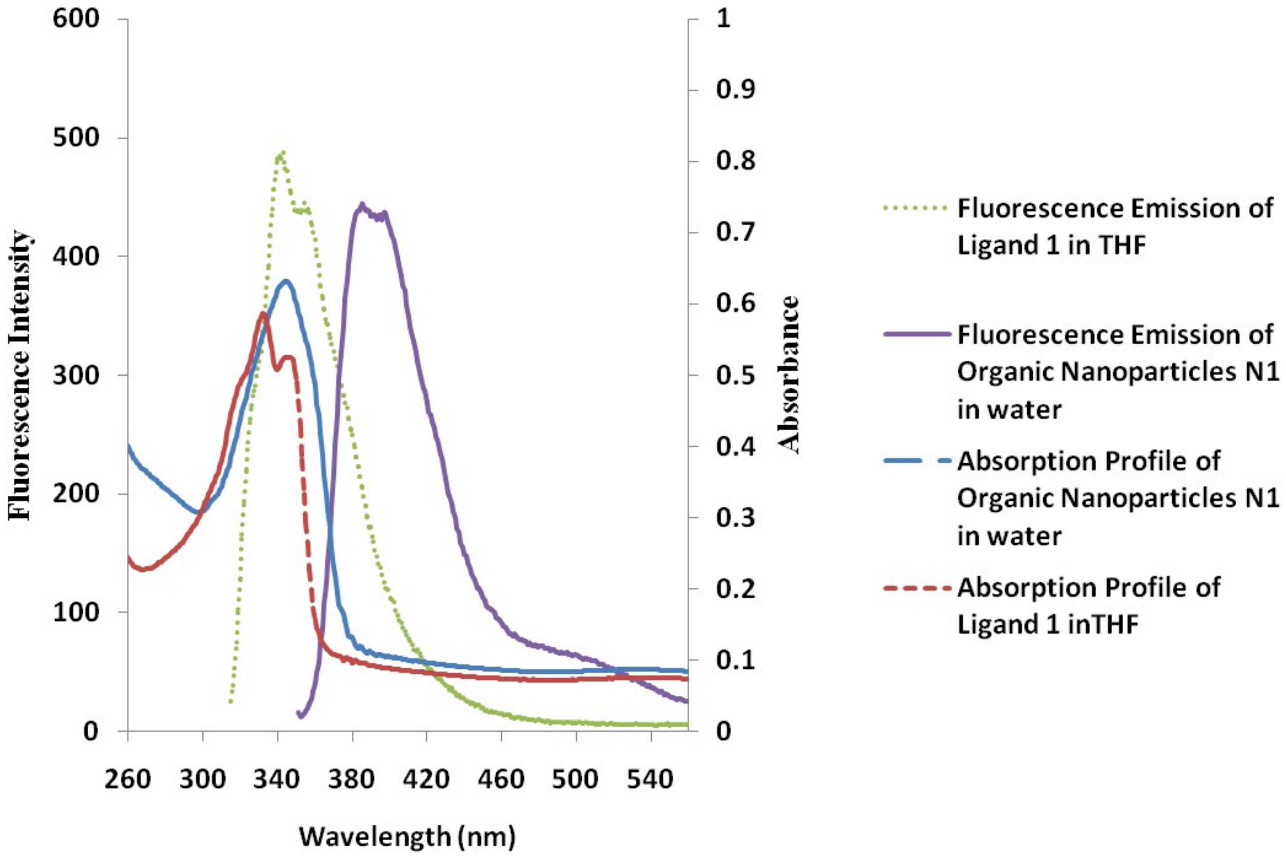


**Figure S5. Fluorescence emission and absorption spectra of ligand 1 (0.492 µM) in THF and organic nanoparticles of ligand 1 (N1) in aqueous medium.**

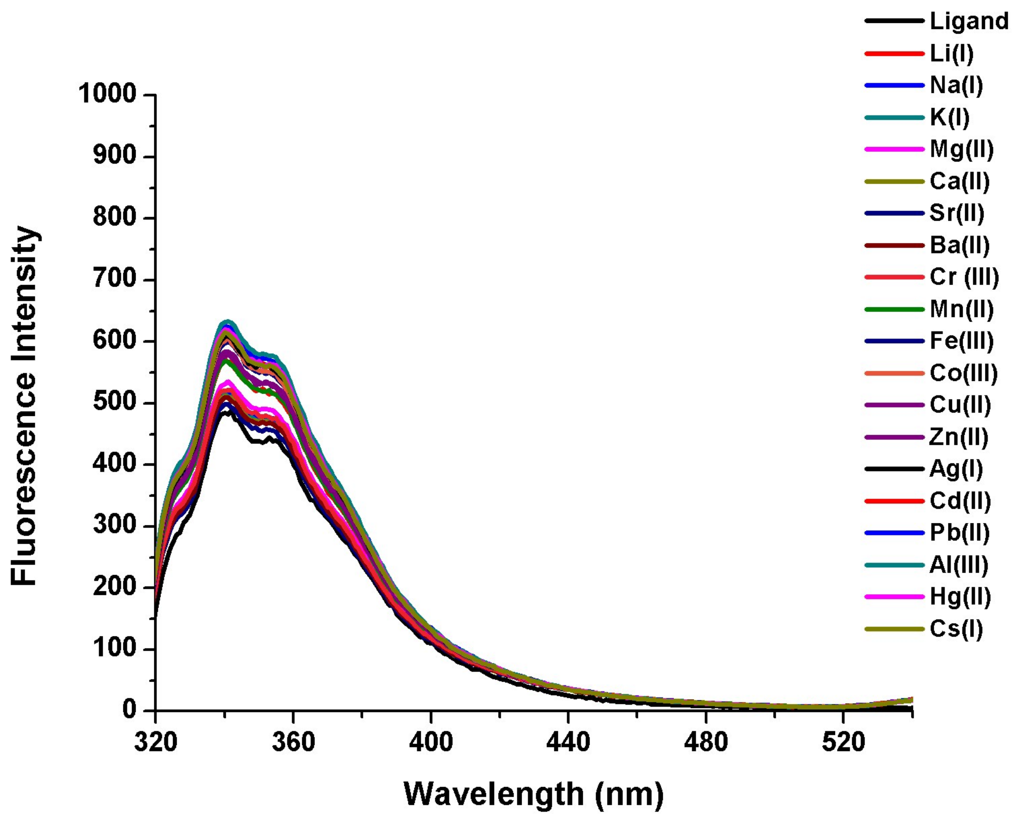


**Figure S6. Changes in emission profile of ligand 1 (0.492 μM) upon addition of 20 μM of a particular metal ion.**

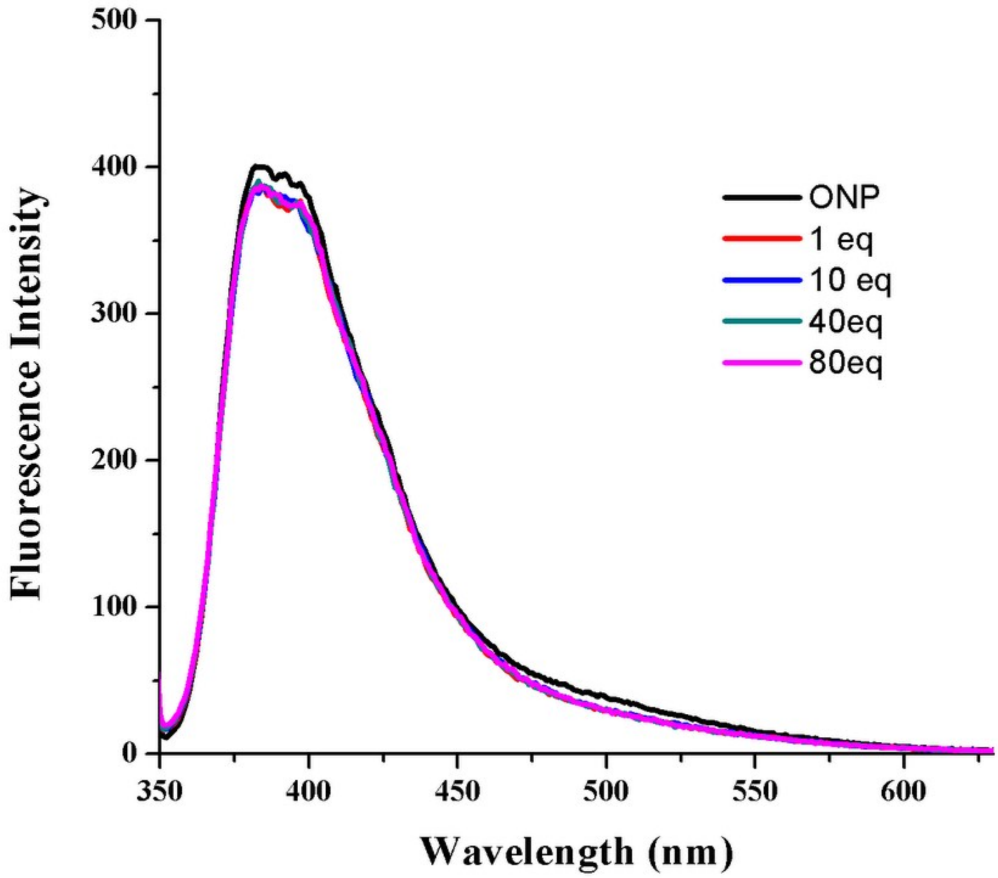


**Figure S7. Effect of ionic strength on ONP N1 upon addition of 0-80 equiv. of TBA salt of perchlorate.**

**Determination of the detection limit.**

The limit of detection of organic nanoparticles **N1** of **1** for $Cr^{3+}$ ion was determined from the following equation:

Limit of Detection= $(3.3*\sigma)/M$

$\sigma$: Standard Deviation = 0.438

M: slope of the calibration curve =22.45

**Table S1. A comparison of present work with reported sensors of $Cr^{3+}$ ion in literature**

| S. No. | Name of Journal | Medium of studies | Detection Limit | Detection Range | Response time | Mode of Detection | Real Sample Analysis |
|---|---|---|---|---|---|---|---|
| 1. | Turn-on fluorogenic and chromogenic detection of $Fe^{3+}$ and $Cr^{3+}$ in a completely water medium with polyacrylamide covalently bonding to rhodamine B using diethylenetriamine as a linker, RSC Advances, 2014, **4**, 46332- 46339. | Aqueous Medium | $9.9\times10^{-6}$ mol $L^{-1}$ | $10\times 10^{-5}$- $45\times 10^{-5}$ mol $L^{-1}$ | ---- | Fluorogenic and Chromogenic Detection | ------ |
| 2. | A single molecular probe for multi-analyte ($Cr^{3+}$, $Al^{3+}$ and $Fe^{3+}$ ) detection in aqueous medium and its biological application, ChemComm, 2014, **50**, 12258-12261. | Water-Ethanol (8:2) | 0.2 µM | -------- | --------- | Fluorescence Determination | Cell imaging in living cells |
| 3. | A new highly sensitive and selective fluorescence chemosensor for $Cr^{3+}$ based on rhodamine B and a 4,13-diaza-18-crown 6-ether conjugate, RSC Advances, 2014, **4**, 2563-2567. | Methanol-Water (3:2) | 0.144 µM | ----------- | ---- | Fluorescence Determination | *In vitro* cell studies |
| 4. | A cell permeable $Cr^{3+}$ selective chemosensor and its application in living cell imaging, RSC Advances, 2013, **3**, 19978-19984. | Ethanol-Water (1:5) HEPES Buffer (0.1 M, pH 7.4) | $3.6\times10^{-7}$ mol $L^{-1}$ | $3.6\times10^{-7}$ – $4.5\times10^{-5}$ mol $L^{-1}$ | 15-20 sec | Fluorescence Determination | Sensor applicability in biological system |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5. | Selective and cyclic detection of $Cr^{3+}$ using poly (methylacrylic acid) monolayer protected gold nanoparticles, New Journal of Chemistry, 2014, **38**, 717-722. | Aqueous Medium | 40 μM | ----- | ---- | Colorimetric Determination | --------- |
| 6. | Visual and near IR (NIR) fluorescence detection of $Cr^{3+}$ in aqueous media via spirobenzopyran ring opening with application in logic gate and bio-imaging, Dalton Transactions, 2014, **43**, 231–239 | $CH_3CN$/ HEPES buffer solution (7/3,v/v) | 6.09 μM with UV titration and 4.6 μM with fluorescence titration | ----- | ------ | Visual and NIR fluorescence detection | Applicability of sensor to cell biology |
| 7. | A selective carbazole-based fluorescent probe for chromium (III), Analytical Methods, 2013, **5**, 5549-5554. | Ethanol–water (9:1,v/v) | 0.10 μmol $L^{-1}$ | 1.0- 20 μmol $L^{-1}$ | ----- | Fluorescence Determination | ------------- |
| 8. | A highly selective and dual responsive test paper sensor of $Hg^{2+}$/$Cr^{3+}$ for naked eye detection in neutral water, RSC Advances, 2012, **2**, 3714–3721 | Acetonitrile | ------ | ------------ | --- | Colorimetric and fluorogenic Determination | ------ |
| 9. | Thiophene anchored naphthalene derivative: $Cr^{3+}$ selective turn-on fluorescent probe for living cell imaging, Analytical Methods, 2012, **4**, 2254-2258. | Water-Methanol (1:9,v/v) | $1.5\times10^{-7}$ M | $1.0\times10^{-6}$-$52\times10^{-6}$ M | -------------- | Fluorescence Determination | Applicability of sensor to living cells |
| 10. | FRET-based sensor for imaging chromium (III) in living cells, ChemComm, 2008, 3387–3389. | Ethanol-Water (2:1,v/v) | ------------- | ---------------- | ---------- | Fluorescent Determination | Monitoring of $Cr^{3+}$ ion in living cells |
| 11. | Recognition of $Hg^{2+}$ and $Cr^{3+}$ in Physiological Conditions by a | $CH_3CN$/ HEPES buffer | 5.6 ppm | ------------- | | UV-Visible and Fluorescence | Cell imaging studies. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Rhodamine Derivative and Its Application as a Reagent for Cell-Imaging Studies, Inorganic Chemistry, 2012, **51**, 336-345 | solution (1 mM; 3:2, v/v) | | | | Determination | |
| 12. | A novel dual-switch fluorescent probe for Cr(III) ion based on PET–FRET processes, Analyst, 2014, **139**, 3607-3613. | $CH_3CN$–HEPES buffer solution | 0.14 nM | 30 nM to 80 μM | ------- | Fluorescence Probe | -------------- |
| 13. | A ratiometric fluorescent chemosensor for $Cr^{3+}$ based on monomer–excimer conversion of a pyrene compound, Sensors and Actuators B: Chemical, 2014,**203**, 712-718 | Tris-$HNO_3$ buffered solution | $4 \times 10^{-8}$ M | $2.0\times 10^{-7}$ - $1.0 \times 10^{-5}$ M | Less than two minutes | Fluorescence Chemosensor | Real sample analysis on river and pond water |

Therefore the proposed sensor depicts high selectivity towards $Cr^{3+}$ ion in aqueous medium with limit of detection (64 nM) in nanomolar range which is quite efficient among other reported sensors in literature. Moreover the present sensor is efficiently determining the presence of $Cr^{3+}$ ion in water samples taken from different sources of water.