**Abstract**

A new simple [pyrene](https://www.sciencedirect.com/topics/chemistry/pyrene" \o "Learn more about Pyrene from ScienceDirect's AI-generated Topic Pages) based [schiff base](https://www.sciencedirect.com/topics/chemistry/schiff-base" \o "Learn more about Schiff Base from ScienceDirect's AI-generated Topic Pages) [chemosensor](https://www.sciencedirect.com/topics/chemistry/molecular-receptor-sensor" \o "Learn more about Molecular Receptor Sensor from ScienceDirect's AI-generated Topic Pages) **1** (nicotinic acid pyren-1-ylmethylene-hydrazide) has been constructed and is prepared from 1-pyrenecarboxaldehyde and nicotinic [hydrazide](https://www.sciencedirect.com/topics/chemistry/hydrazide" \o "Learn more about Hydrazide from ScienceDirect's AI-generated Topic Pages). Notably, the chemosensor **1**exhibited remarkable colour changes while in the presence of trivalent [metal ions](https://www.sciencedirect.com/topics/chemistry/metal-ion) like Bi3+ & Al3+ ion in DMSO-H2O, (1:1 v/v, HEPES = 50 mM, pH = 7.4). The [UV–Vis](https://www.sciencedirect.com/topics/chemistry/uv-vis-spectroscopy) spectral investigation of chemosensor **1** showed that the [maximum absorption](https://www.sciencedirect.com/topics/chemistry/absorption-maxima) peak appeared at 378 nm. In emission studies, chemosensor **1**develops weak fluorescence, while upon the addition of Bi3+ and Al3+ ions, it exhibits an enhancement of [fluorescence intensity](https://www.sciencedirect.com/topics/chemistry/fluorescence-intensity). Nevertheless, rest of metal ions have no changes in the emission spectra. The association constant of chemosensor **1** for binding to Bi3+ & Al3+ system had a value of 1.27 × 104 M−1and 1.53 × 104 M−1. The detection limits were 0.12 µM for Bi3+ and 0.17 µM for Al3+ respectively. The overall results reveal that chemosensor **1** can act as a dual-channel, highly selective, and sensitive probe for Bi3+ and Al3+ ions. Moreover, the fluorescence imaging of chemosensor **1** was applied in RAW 264.7 cell line and cytotoxicity assay prove that this chemosensor **1** is non-toxic as well as highly biocompatible.