Asparagine Modified Downconversion $NaGdF_4:Dy^{3+}/Tb^{3+}$ Nanophosphor for Selective and Sensitive Detection of Cu (II) Ion

Lobzang Tashi[a], Richa Singhaal[a], Zaib ul Nisa[a], Swaita Devi[a], Haq Nawaz Sheikh[a]*

[a]Department of Chemistry, University of Jammu, Baba Sahib Ambedkar Road, Jammu-180006, India

hnsheikh@rediffmail.com

(Supplementary Information)

Table of Contents

CONTENTS **Pages**

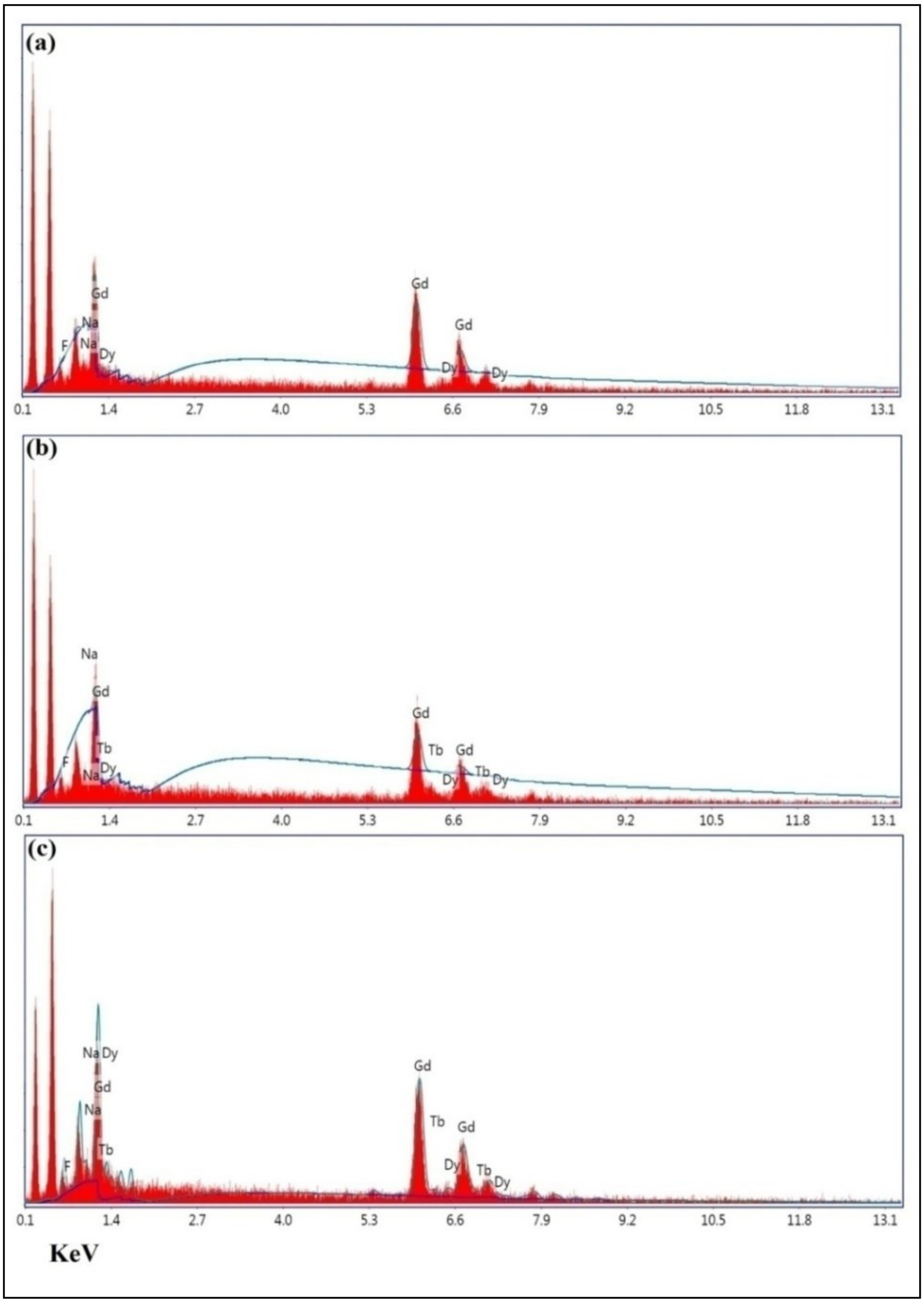

Fig. S1 EDS spectra of (a) Dy^{3+} doped $NaGdF_4$ and Dy^{3+}/Tb^{3+} co-doped $NaGdF_4$ nanophosphors with different Tb^{3+} contents; (b) 3%. (c) 5% and (d) 10%.

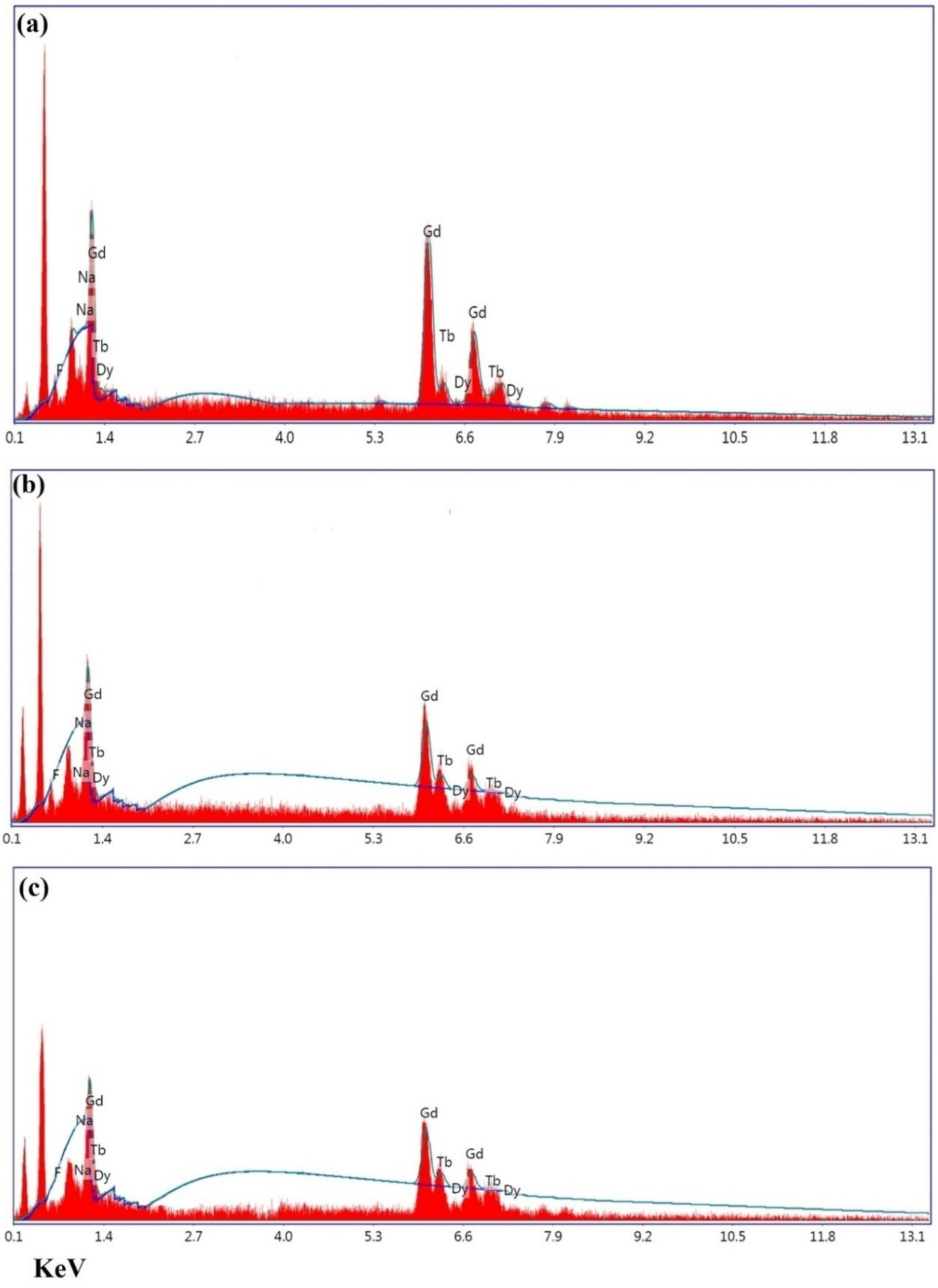

Fig. S2 EDS spectra of Dy^{3+}/Tb^{3+} co-doped $NaGdF_4$ nanophosphors with different Tb^{3+} contents; (a) 10%, (b) 15% and (c) 20%.

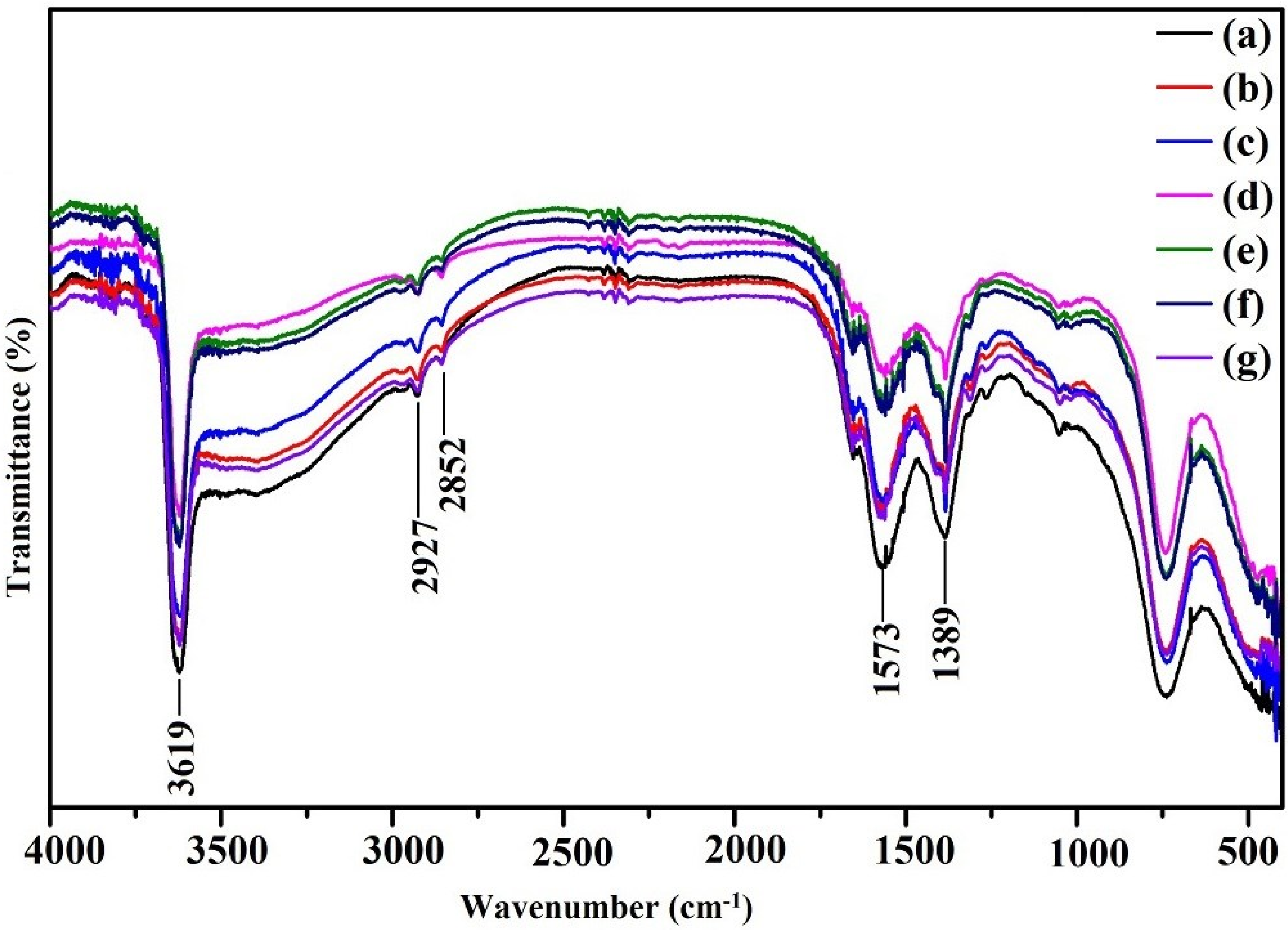

Fig. S3 FTIR spectra of synthesized nanomaterials (a) $NaGF_4$, (b) $NaGF_4:Dy^{3+}$ and (c-g) $NaGF_4:Dy^{3+}/Tb^{3+}$ with different Tb^{3+} contents; (c) 3%, (d) 5%, (e) 10%, (f) 15% and (g) 20%.

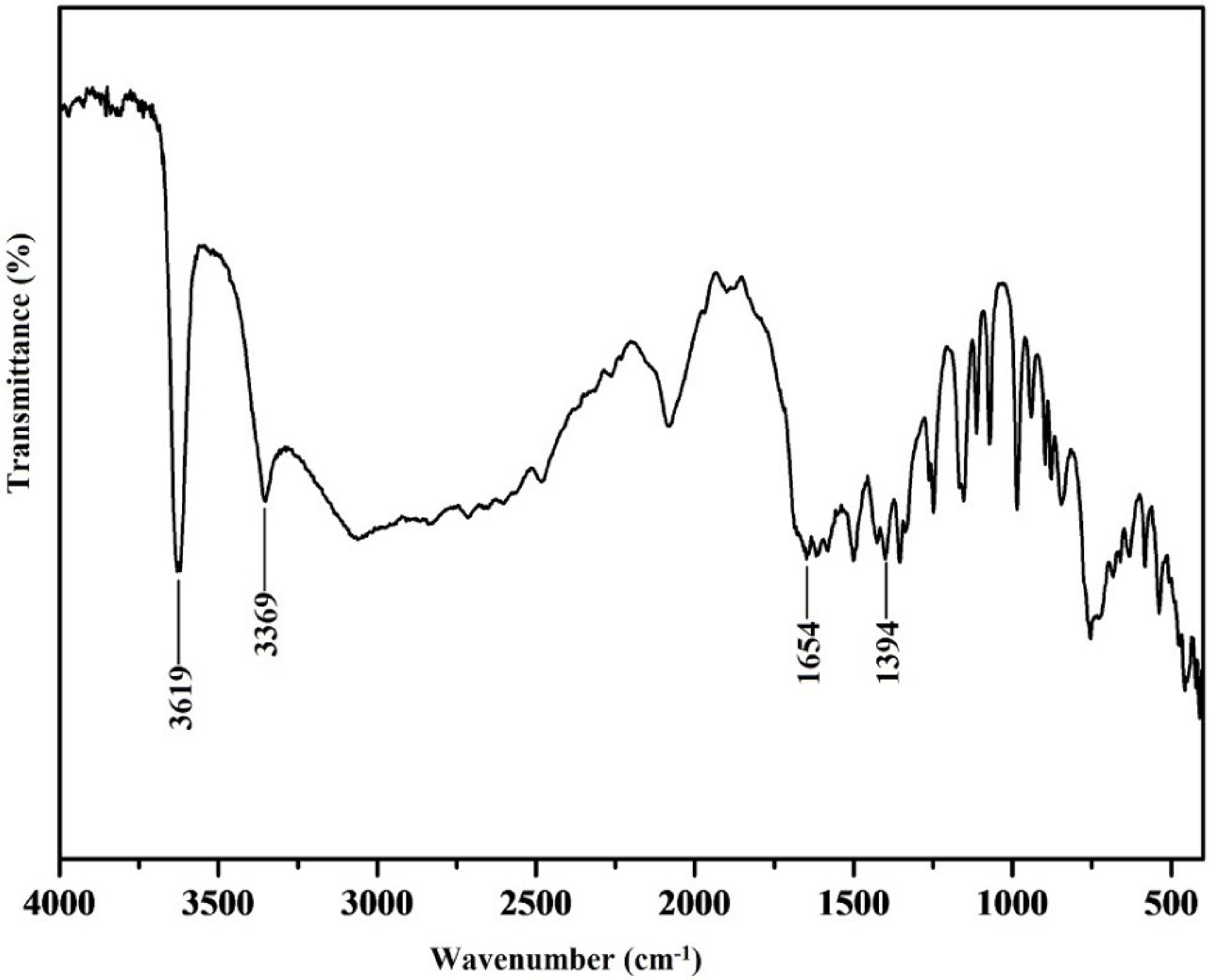

Fig. S4 FTIR spectra of $NaGF_4$:Dy^{3+}/Tb^{3+} nanophosphor functionalized with asparagine amino acid.

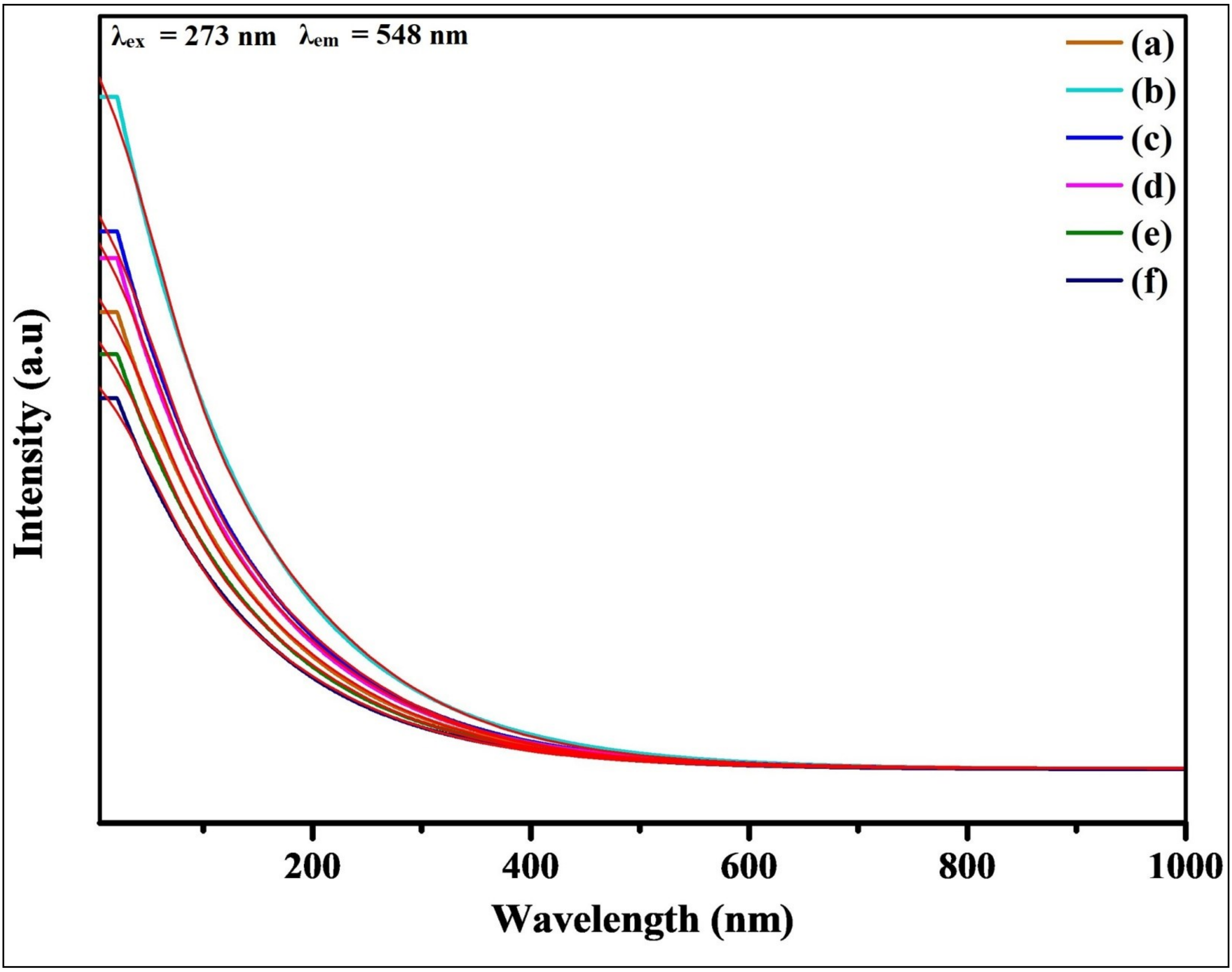

Fig. S5 Photoluminescence decay curves of (a) $NaGdF_4:Dy^{3+}$ and (b-f) $NaGdF_4:Dy^{3+}/Tb^{3+}$ with different Tb^{3+} contents; (b) 3%, (c) 5%, (d) 10%, (e) 15% and (f) 20%.

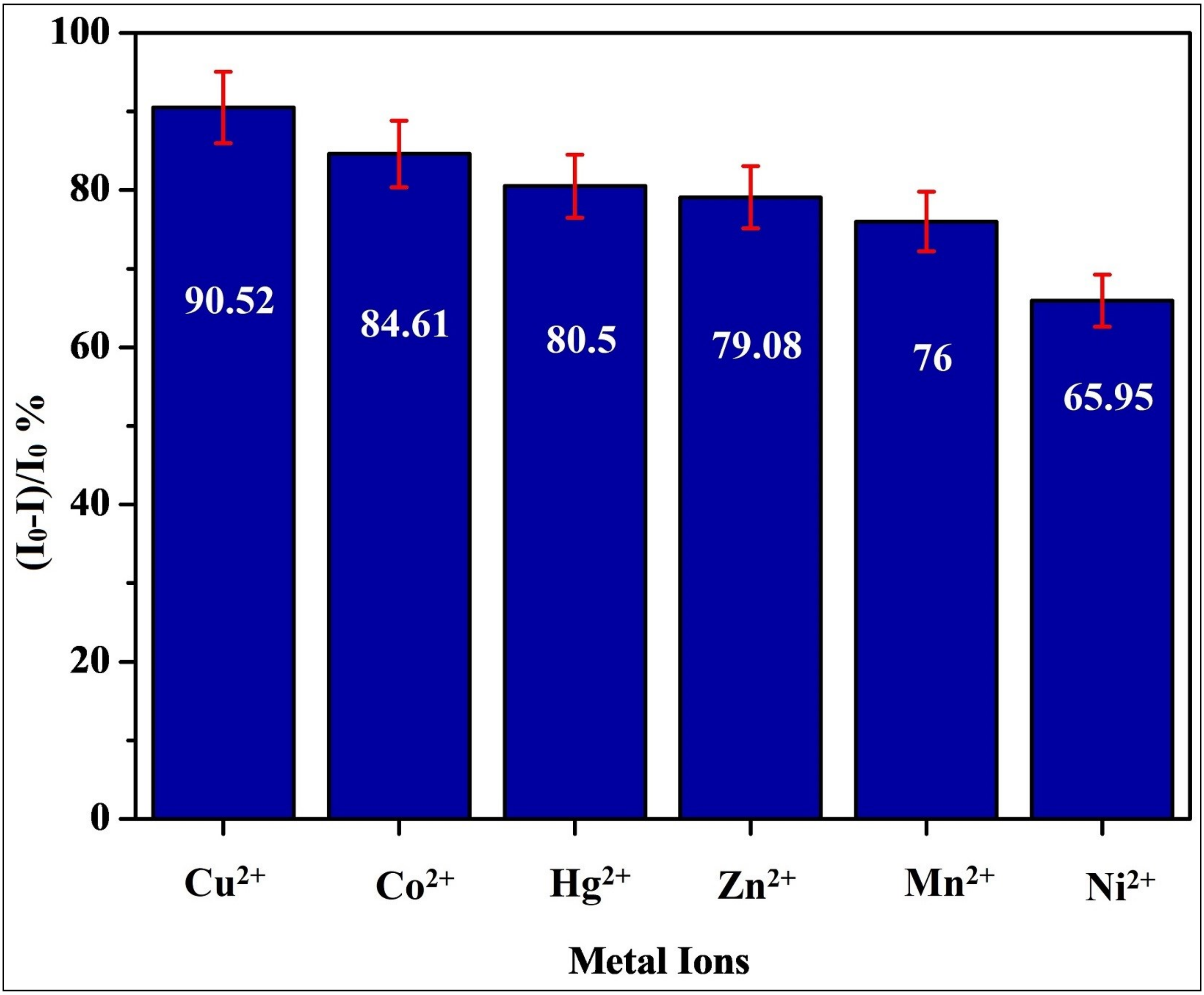

Fig. S6 Quenching efficiency of the nanostructure Aap-NP and different heavy metal ions (100 ppm) in aqueous solution.

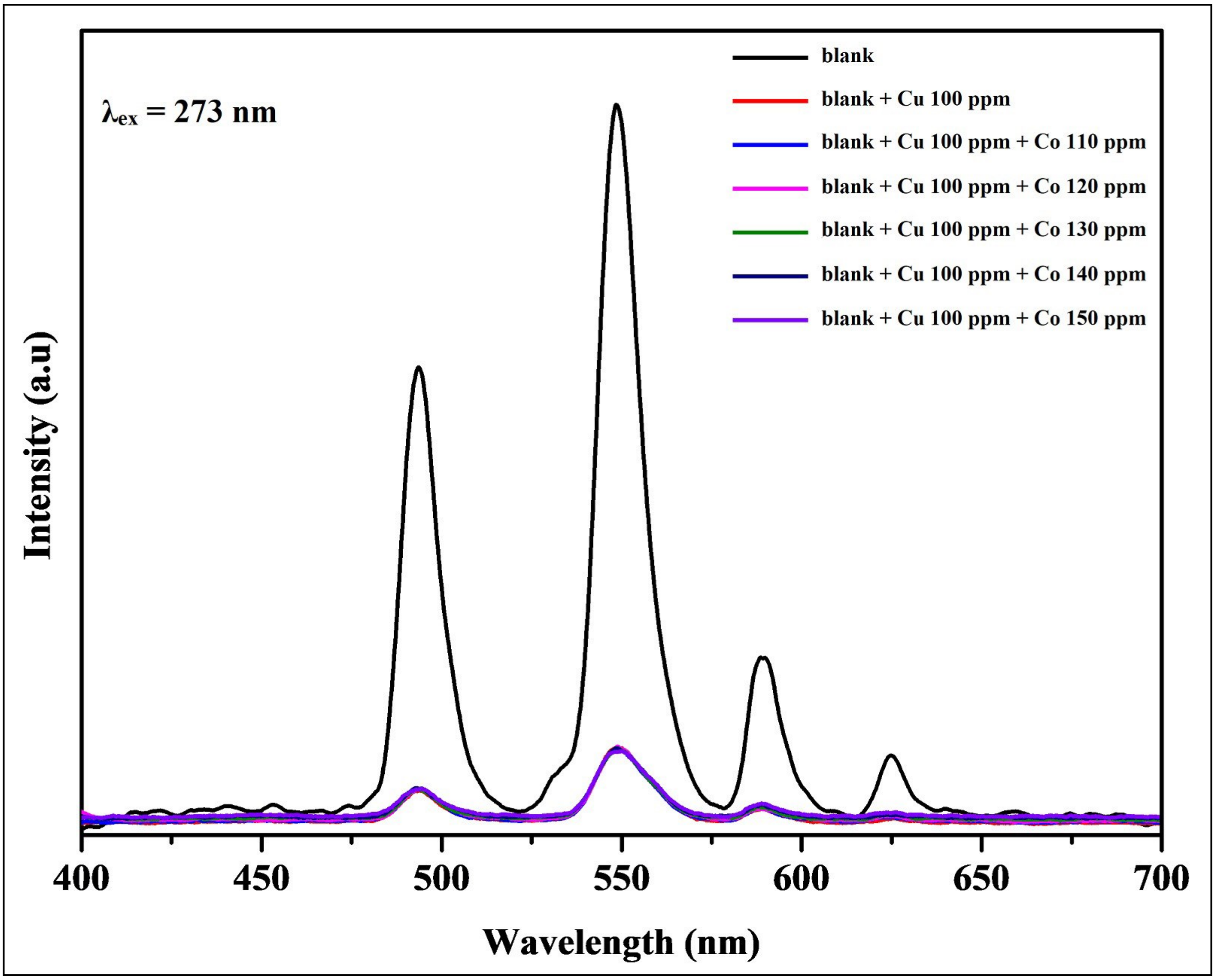

Fig. S7 Photoluminescence spectra of Asp-NP after the addition of Cu^{2+} ion along with different concentrations of Co^{2+} ion.

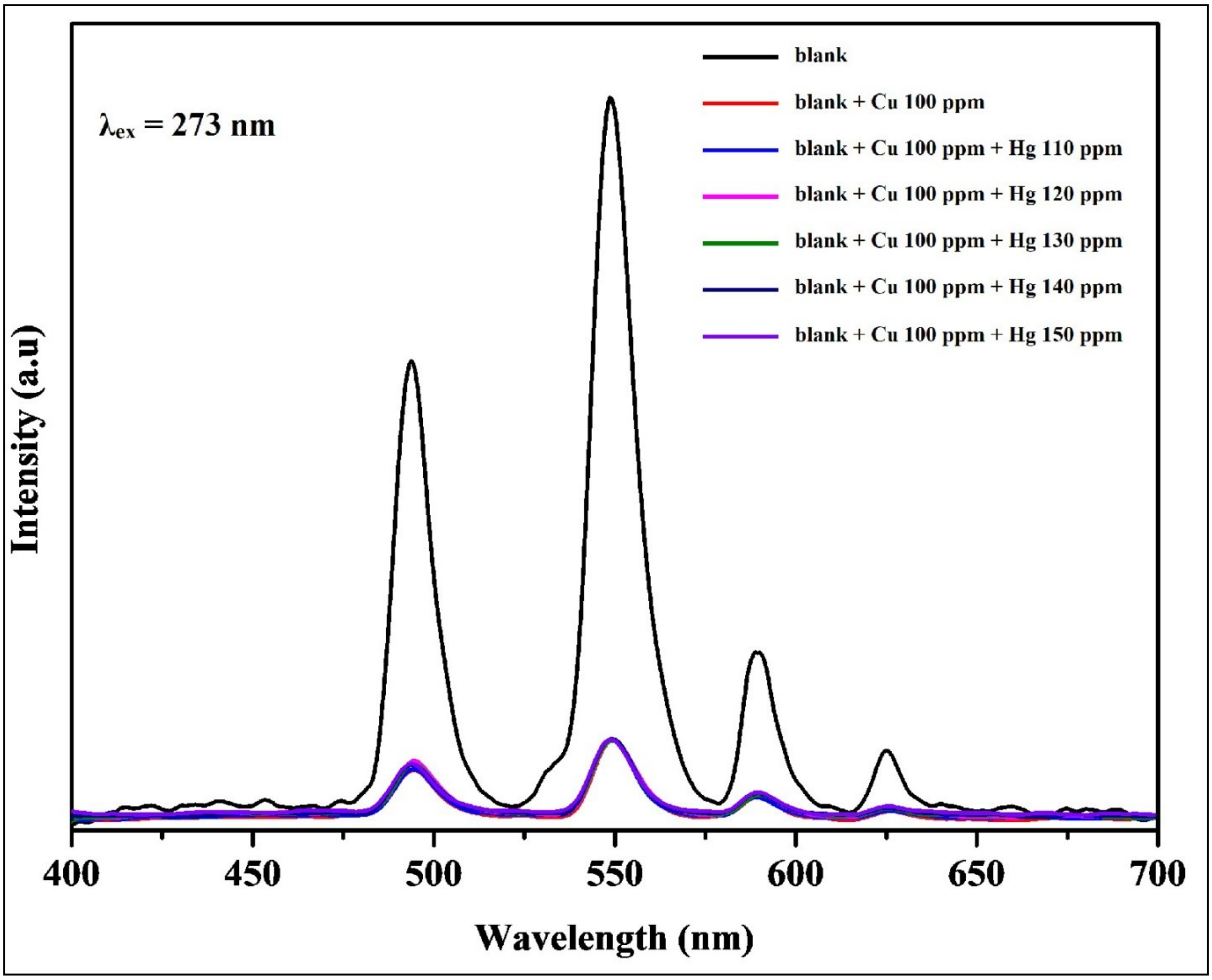

Fig. S8 Luminescence spectra of Asp-NP after the addition of Cu^{2+} ion along with different concentrations of Hg^{2+} ion.

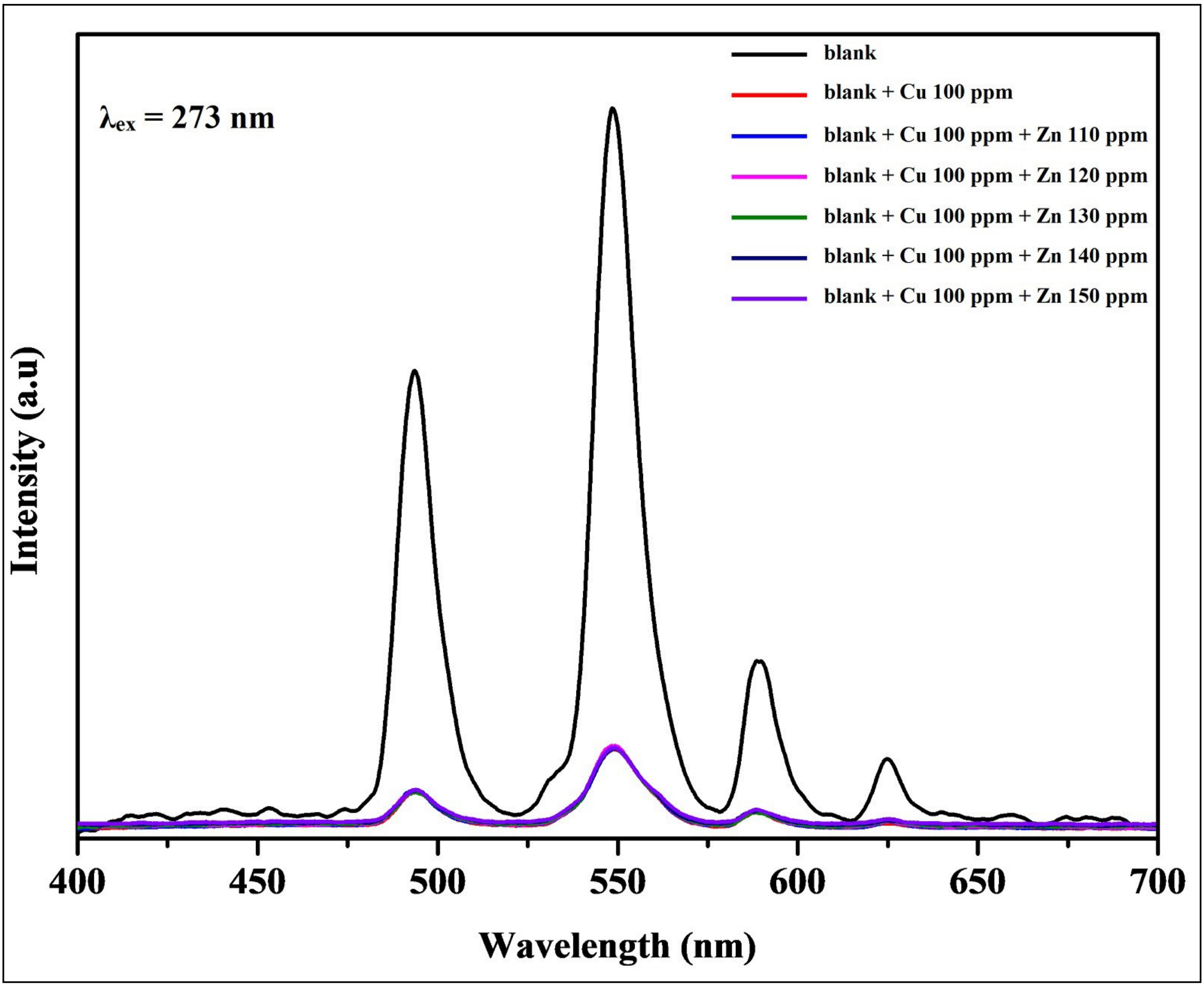

Fig. S9 Photoluminescence spectra of Asp-NP after the addition of Cu^{2+} ion along with different concentrations of Zn^{2+} ion.

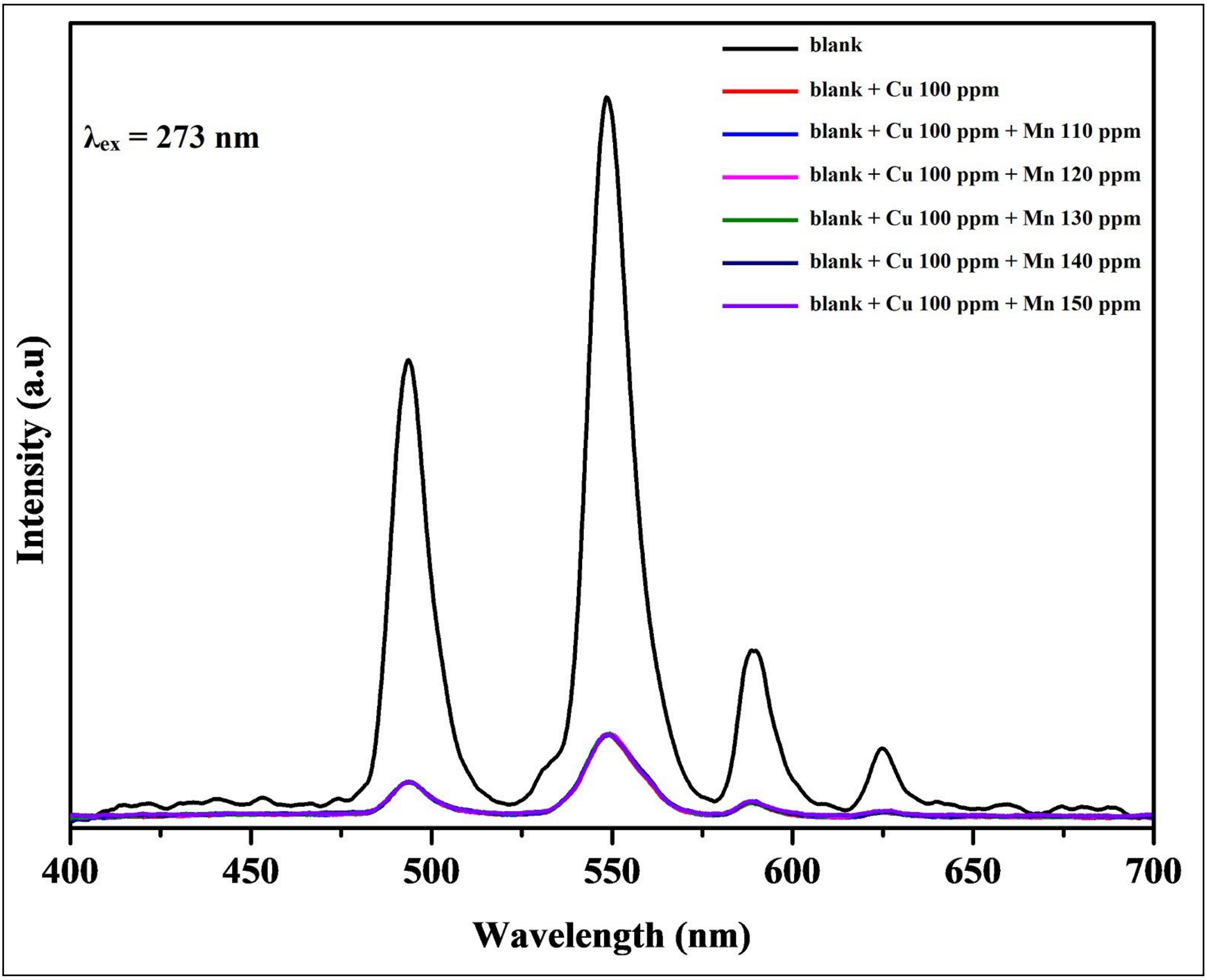

Fig. S10 Photoluminescence spectra of Asp-NP after the addition of Cu^{2+} ion along with different concentrations of Mn^{2+} ion.

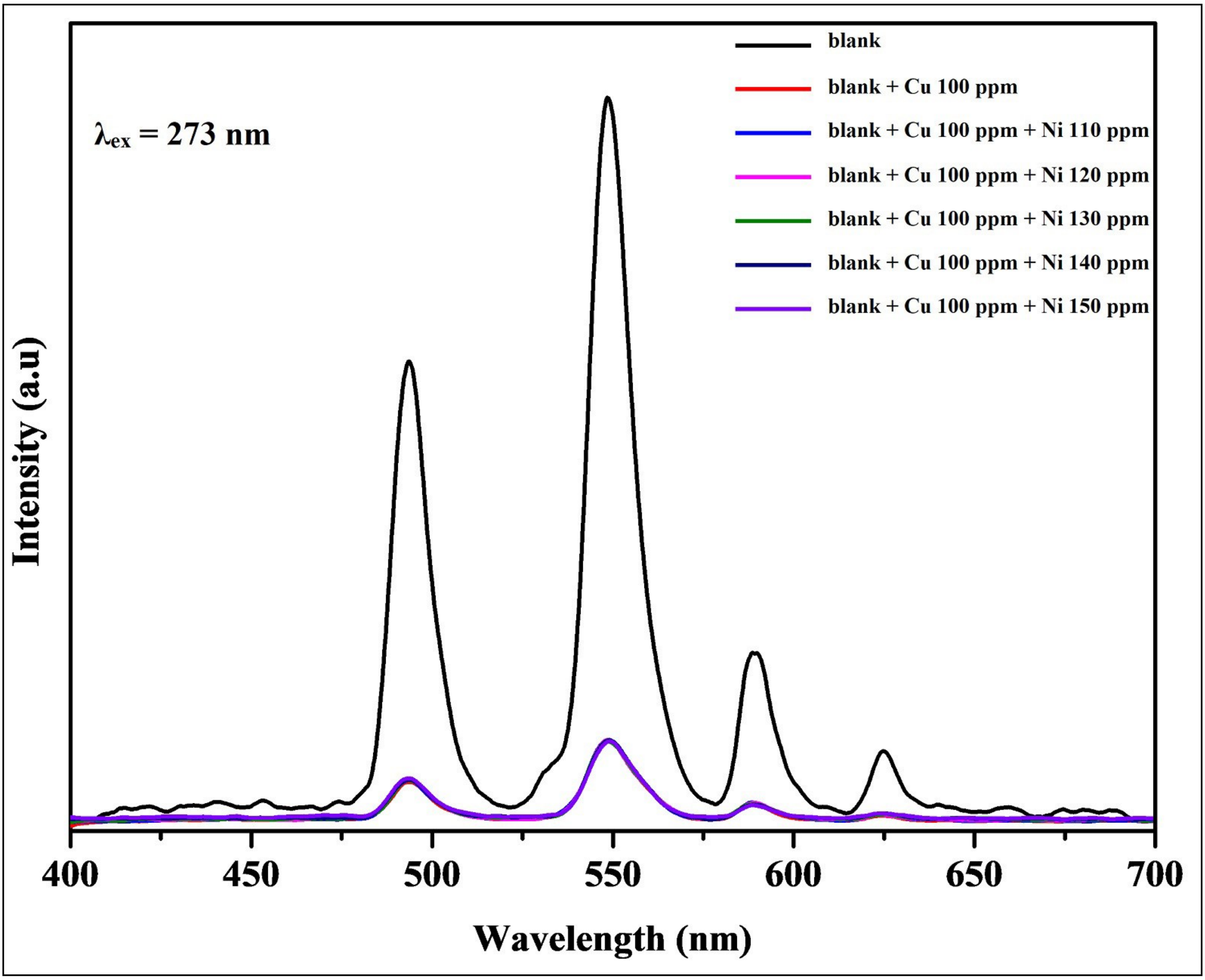

Fig. S11 Luminescence spectra of Asp-NP after the addition of Cu^{2+} ion along with different concentrations of Ni^{2+} ion.

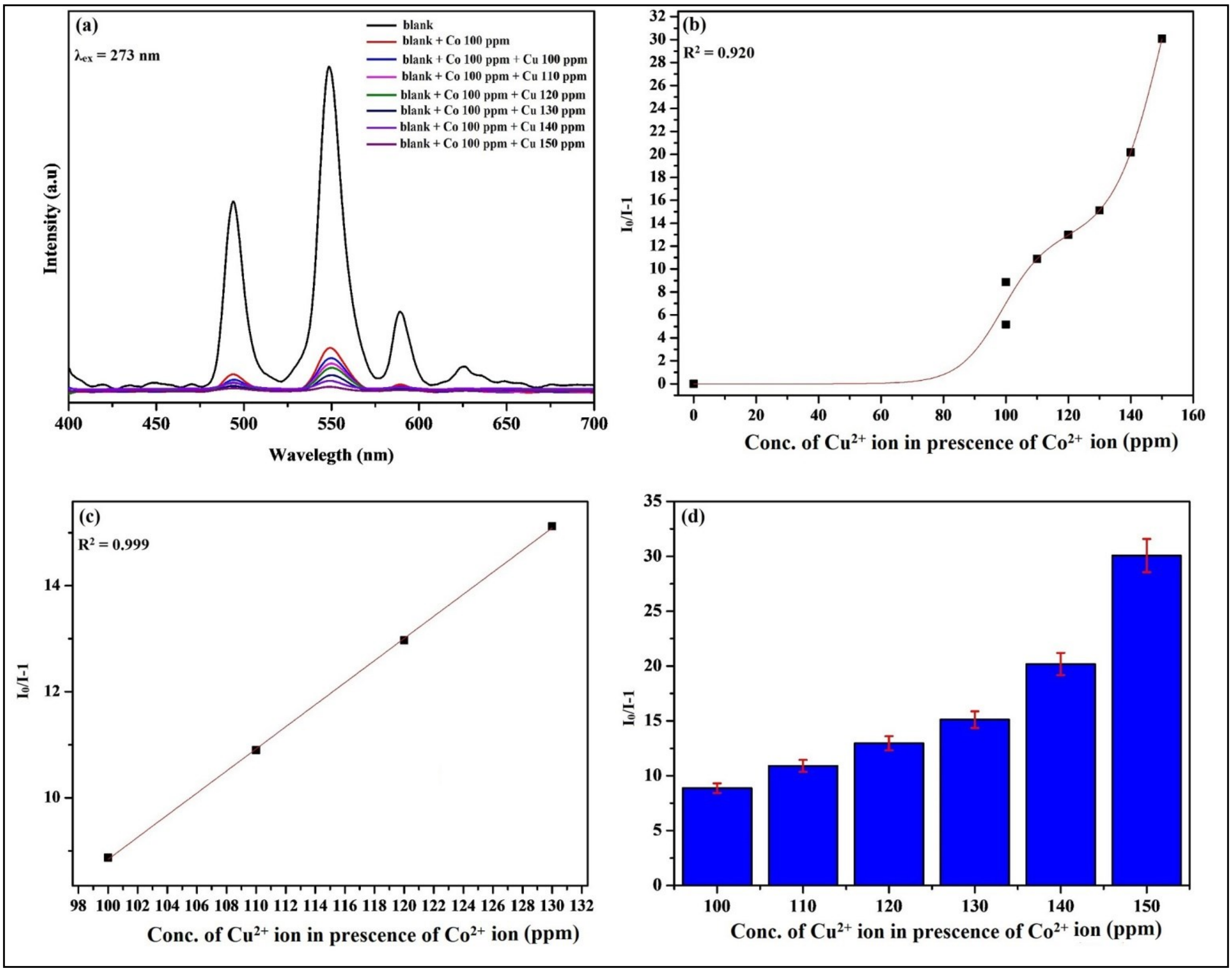

Fig. S12 (a) Luminescence spectra of Asp-NP after the addition of Co^{2+} ion along with different concentrations of Cu^{2+} ion (from 100 to 150 ppm), (b) Nonlinear Stern-Volmer plot, (c) linear Stern-Volmer fitting and (d) error bar.