Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information of

Malonamide dithiocarbamate functionalized gold nanoparticles for colorimetric sensing of Cu^{2+} and Hg^{2+} ions

Vaibhavkumar N. Mehta and Suresh Kumar Kailasa*

Department of Chemistry, S. V. National Institute of Technology, Surat-395 007, India

**Corresponding author, Phone: +91-261-2201730; Fax: +91-261-2227334*

E-mail: sureshkumarchem@gmail.com

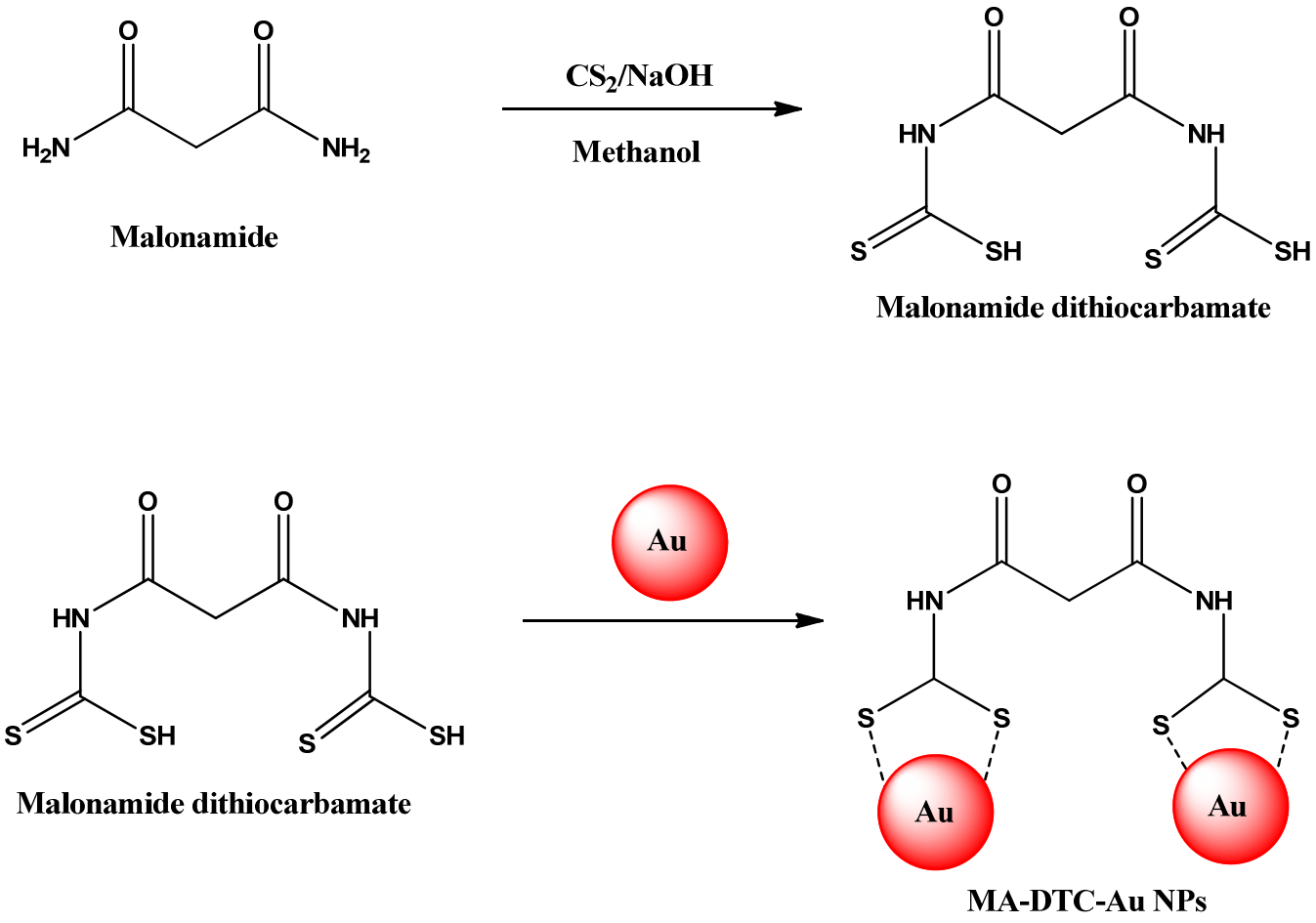


Figure S1. Schematic representation for synthesis of MA-DTC ligand and MA-DTC-Au NPs.

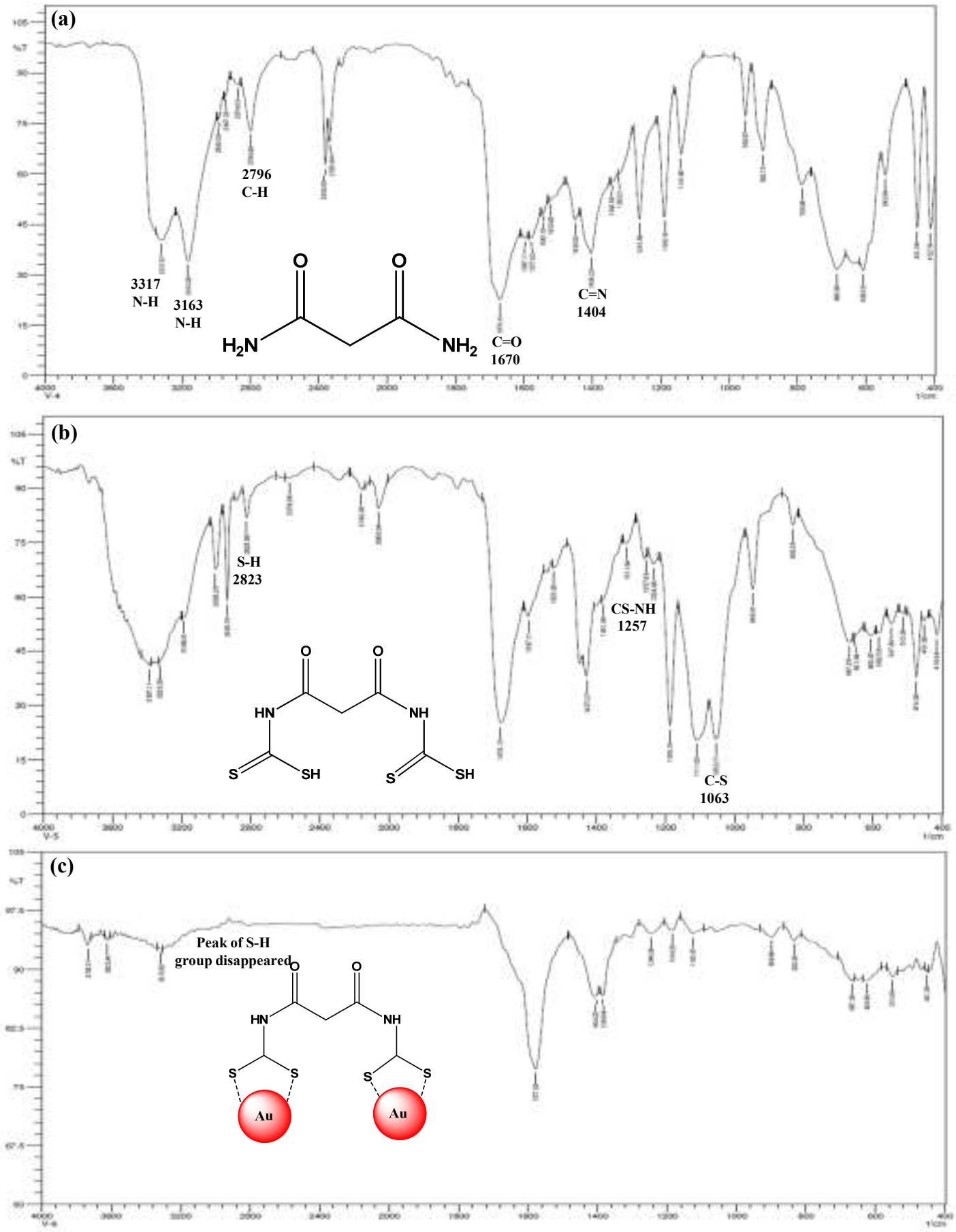


Figure S2. FT IR spectra of (a) pure malonamide (b) MA-DTC and (c) MA-DTC-Au NPs.

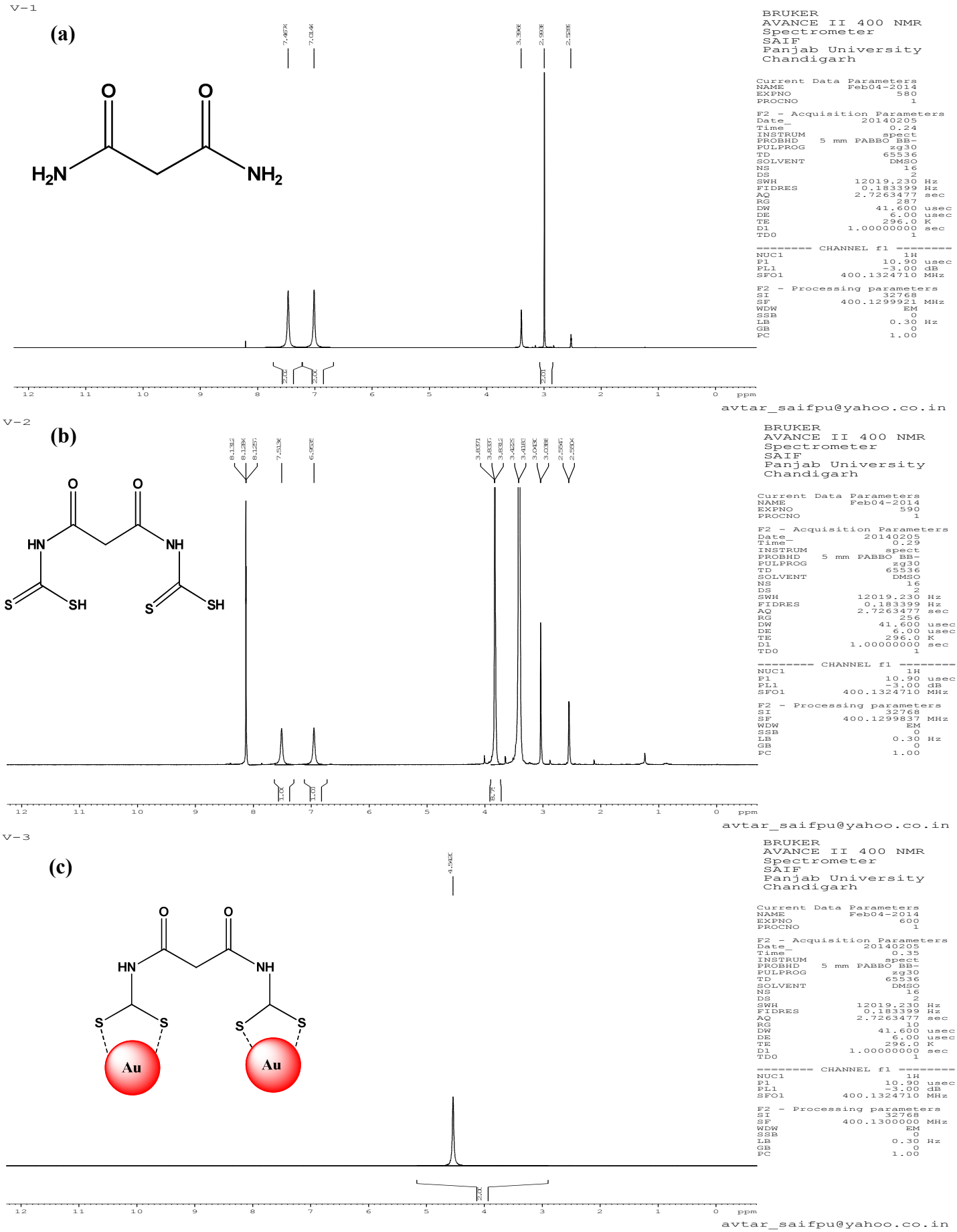


Figure S3. ^{1}H NMR spectra of (a) pure malonamide (b) MA-DTC and (c) MA-DTC-Au NPs.

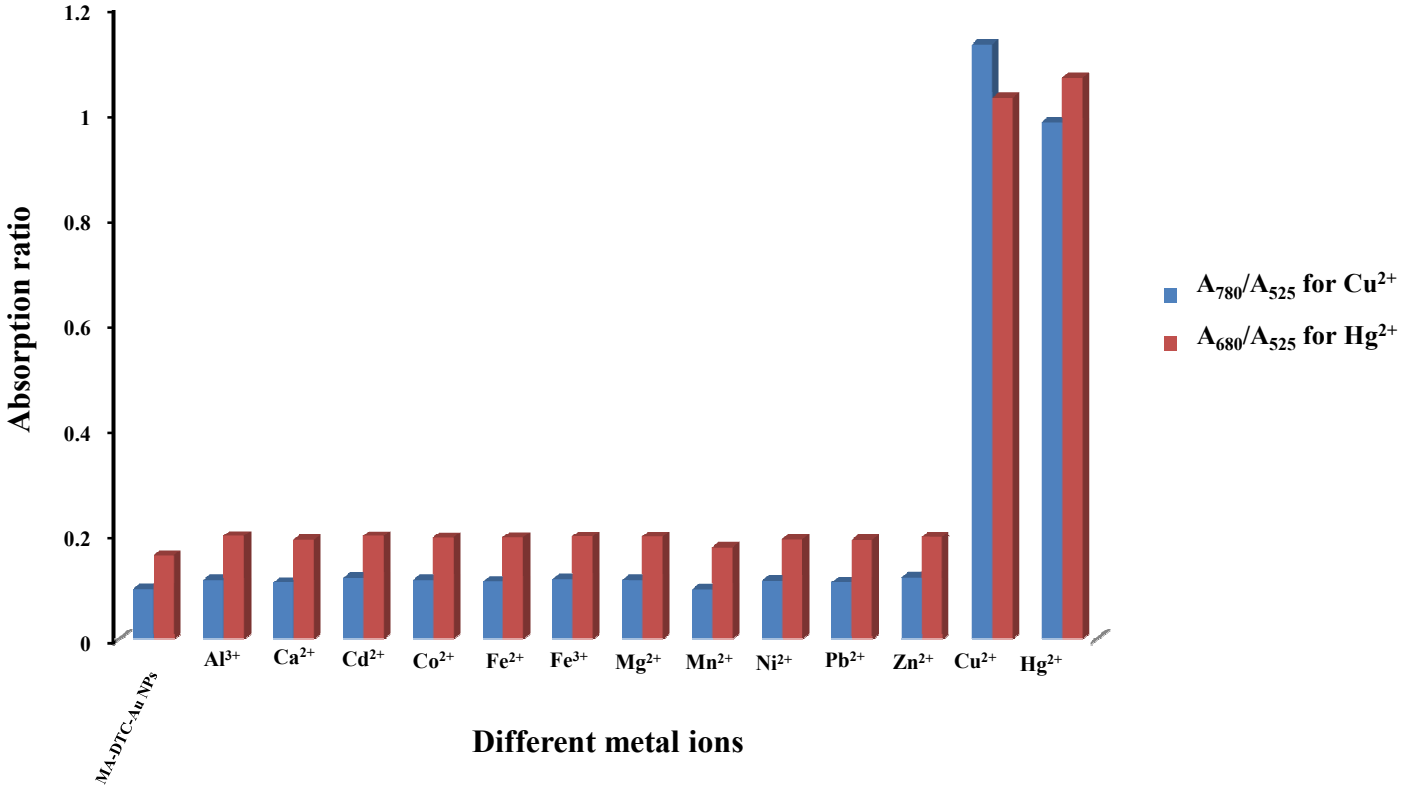


Figure S4. The UV-visible absorption ratios of MA-DTC-Au NPs at $A_{780\ nm}/A_{525\ nm}$ and $A_{680\ nm}/A_{525\ nm}$ in the presence of Cu^{2+} and Hg^{2+} ion over other metal ions (Al^{3+}, Ca^{2+}, Cd^{2+}, Co^{2+}, Fe^{2+}, Fe^{3+}, Mg^{2+}, Mn^{2+}, Ni^{2+}, Pb^{2+}, Zn^{2+}).

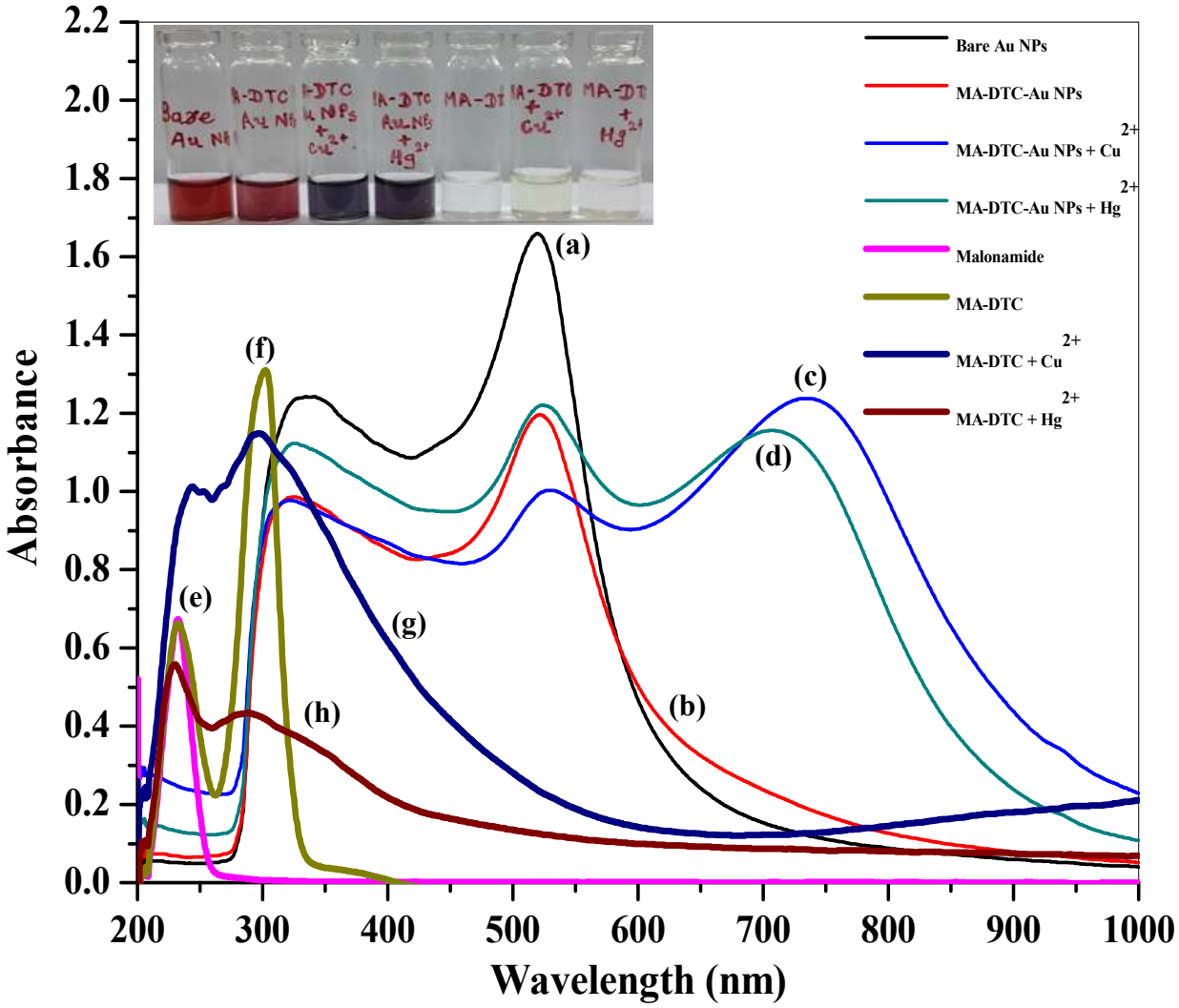
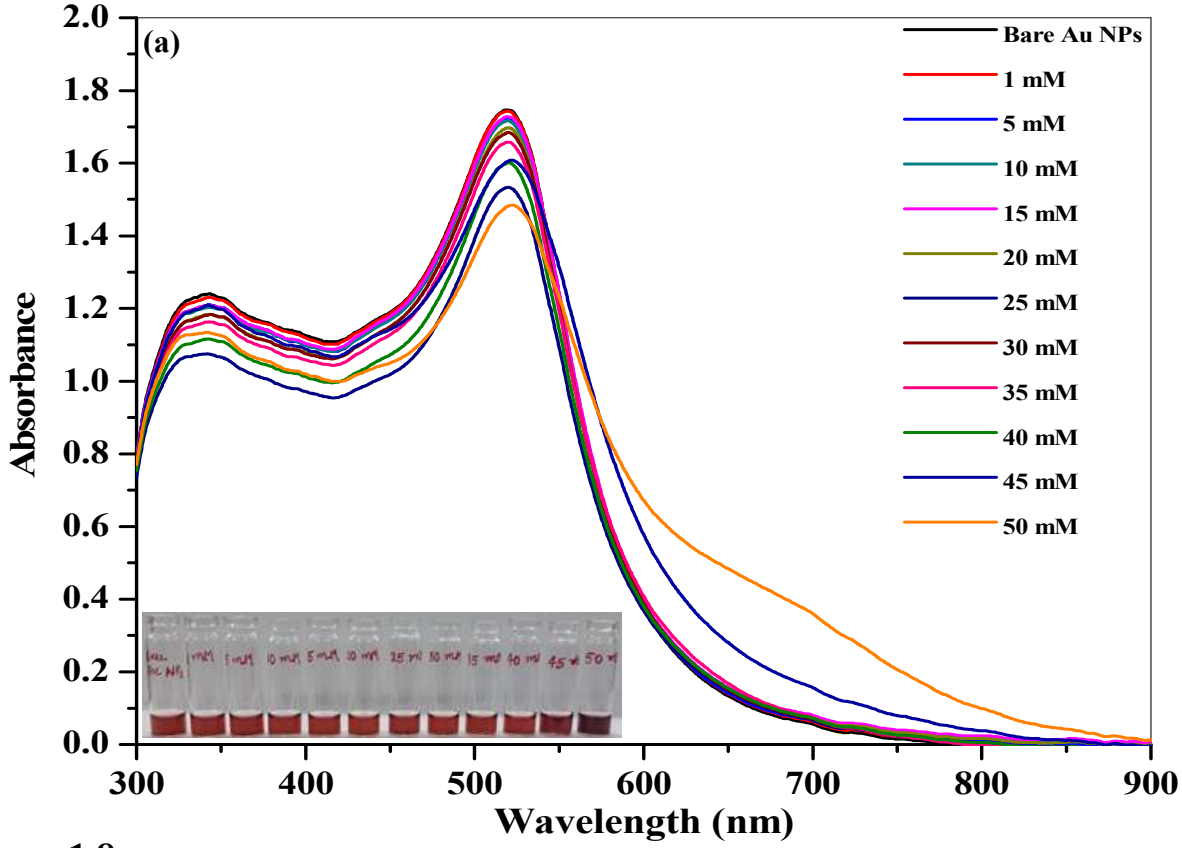
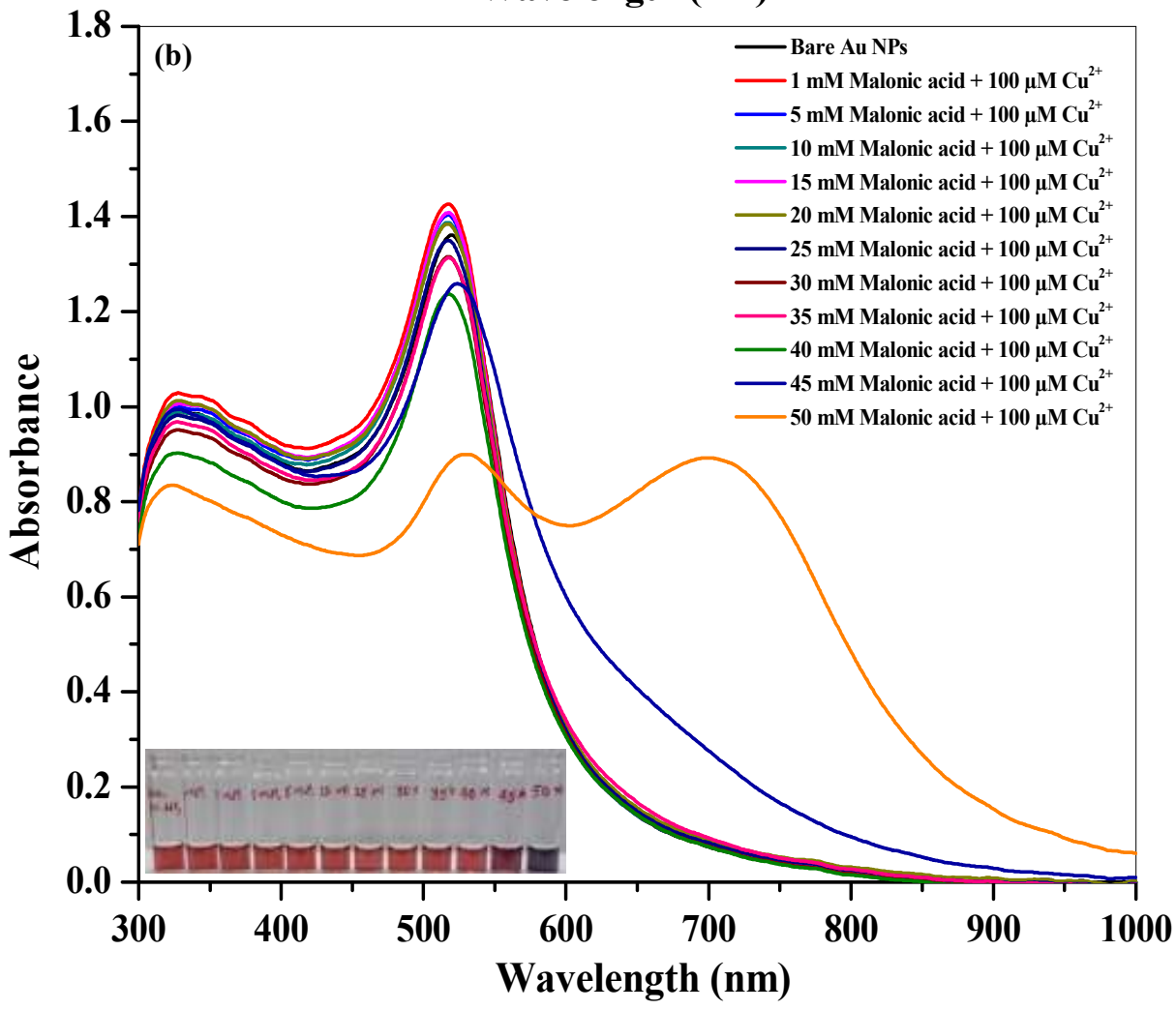


Figure S5. The UV-visible absorption spectra and photographic image of (a) bare Au NPs (b) MA-DTC-Au NPs, MA-DTC-Au NPs in presence of 100 µM (c) Cu^{2+} (d) Hg^{2+} (e) pure malonamide (f) MA-DTC (g) MA-DTC-Cu^{2+} complex and (h) MA-DTC-Hg^{2+} complex.


(a)
Absorbance
Wavelength (nm)
Bare Au NPs
1 mM
5 mM
10 mM
15 mM
20 mM
25 mM
30 mM
35 mM
40 mM
45 mM
50 mM


(b)
Absorbance
Wavelength (nm)
Bare Au NPs
1 mM Malonic acid + 100 µM Cu2+
5 mM Malonic acid + 100 µM Cu2+
10 mM Malonic acid + 100 µM Cu2+
15 mM Malonic acid + 100 µM Cu2+
20 mM Malonic acid + 100 µM Cu2+
25 mM Malonic acid + 100 µM Cu2+
30 mM Malonic acid + 100 µM Cu2+
35 mM Malonic acid + 100 µM Cu2+
40 mM Malonic acid + 100 µM Cu2+
45 mM Malonic acid + 100 µM Cu2+
50 mM Malonic acid + 100 µM Cu2+

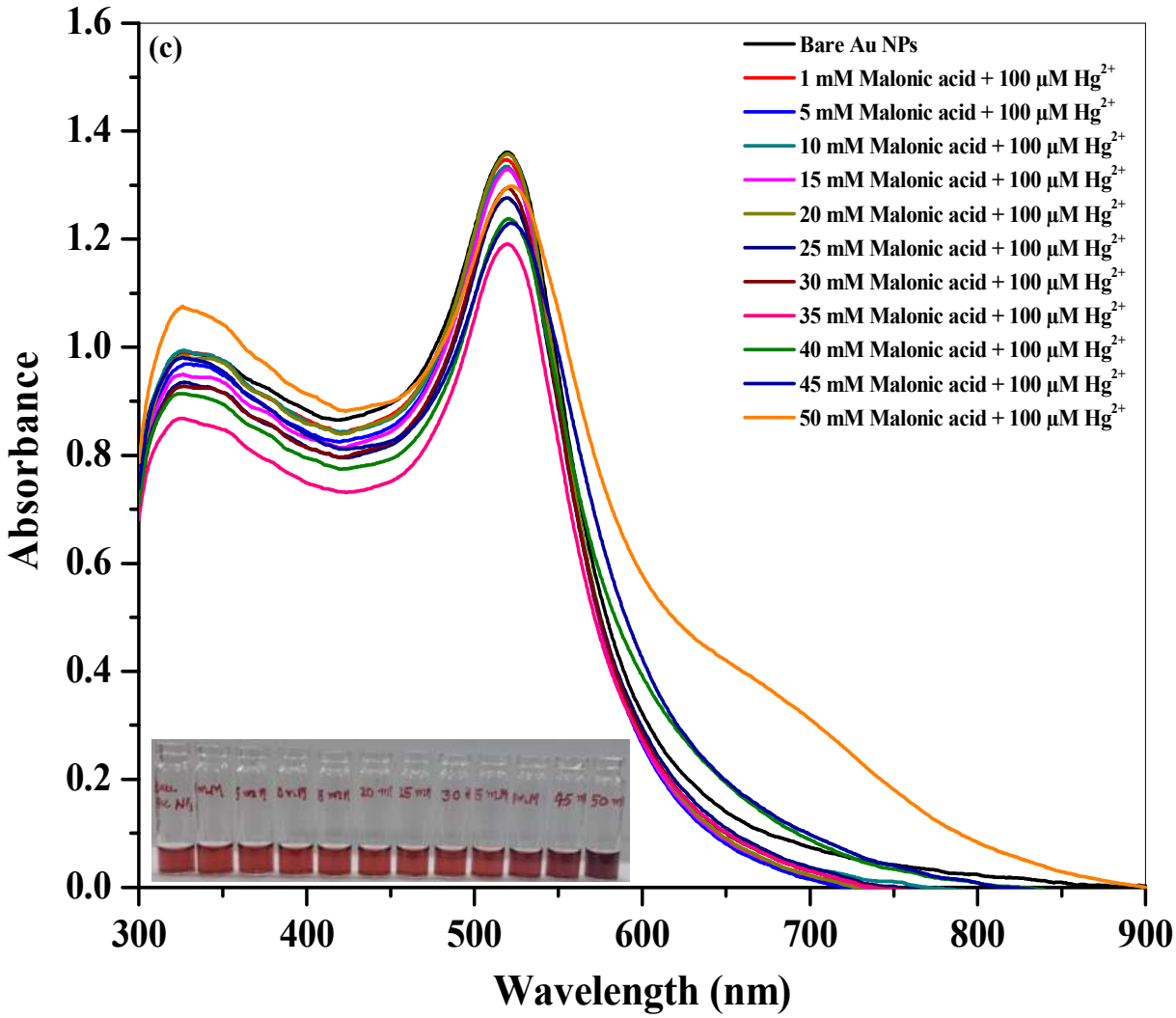


Figure S6: UV-visible spectra and photographic image of (a) Malonic acid functionalized Au NPs with the different concentration of malonic acid (0.1 mM to 50 mM) (b) Au NPs functionalized with different concentrations of malonic acid in presence of 100 µM Cu^{2+} ions and (c) Au NPs functionalized with different concentrations of malonic acid in presence of 100 µM Hg^{2+} ions

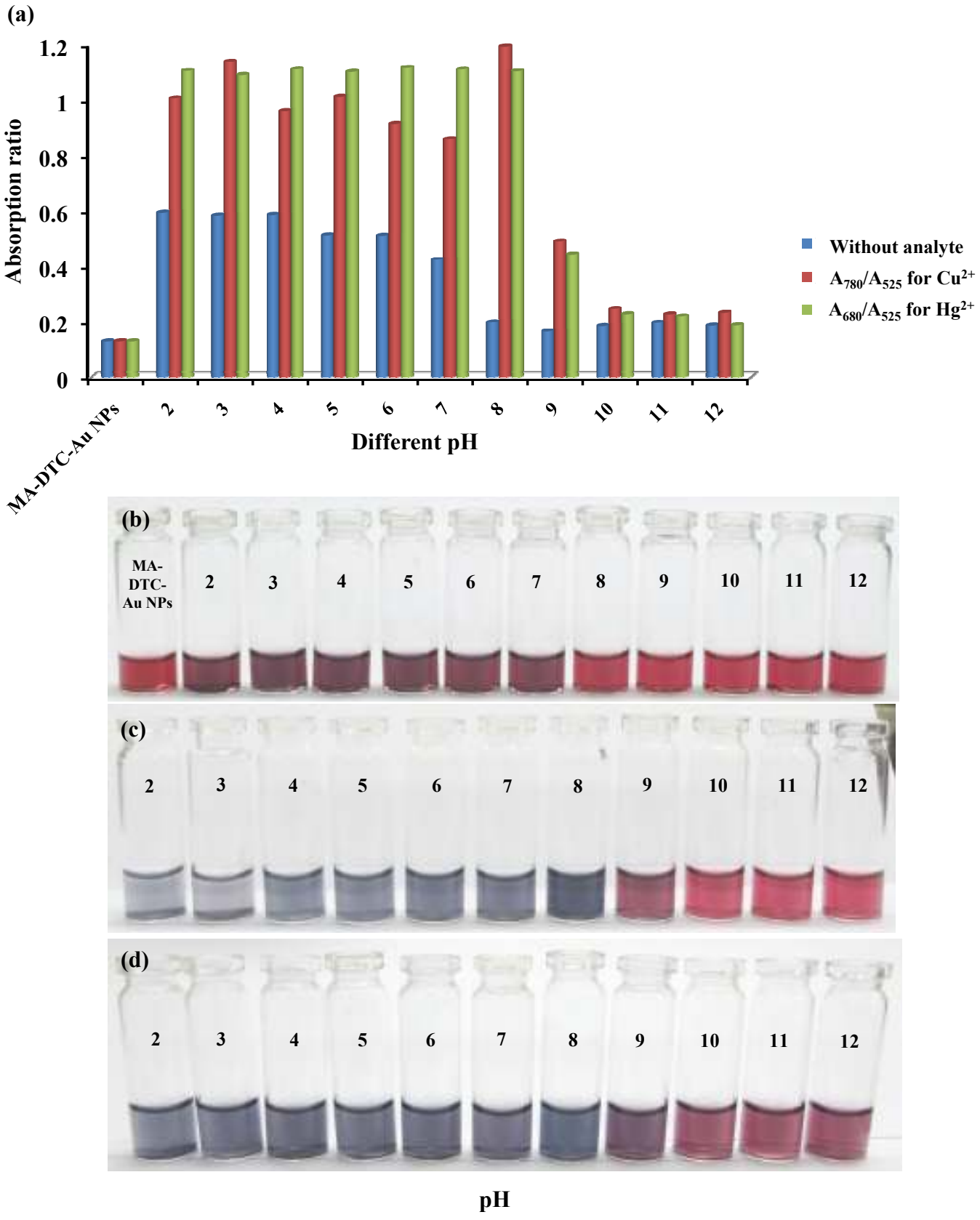


Figure S7. (a) The UV-visible absorption ratios ($A_{780\ nm}/A_{525\ nm}$ and $A_{680\ nm}/A_{525\ nm}$) of MA-DTC-Au NPs induced aggregation in the presence of Cu^{2+} and Hg^{2+} ions by using Tris HCl buffer at pH 8.0. (b) Photographic image of MA-DTC-Au NPs (b) without analyte (c) in presence of Cu^{2+} ion and (d) Hg^{2+} ion in the pH range of 2-12 by using Tris-HCl buffer.

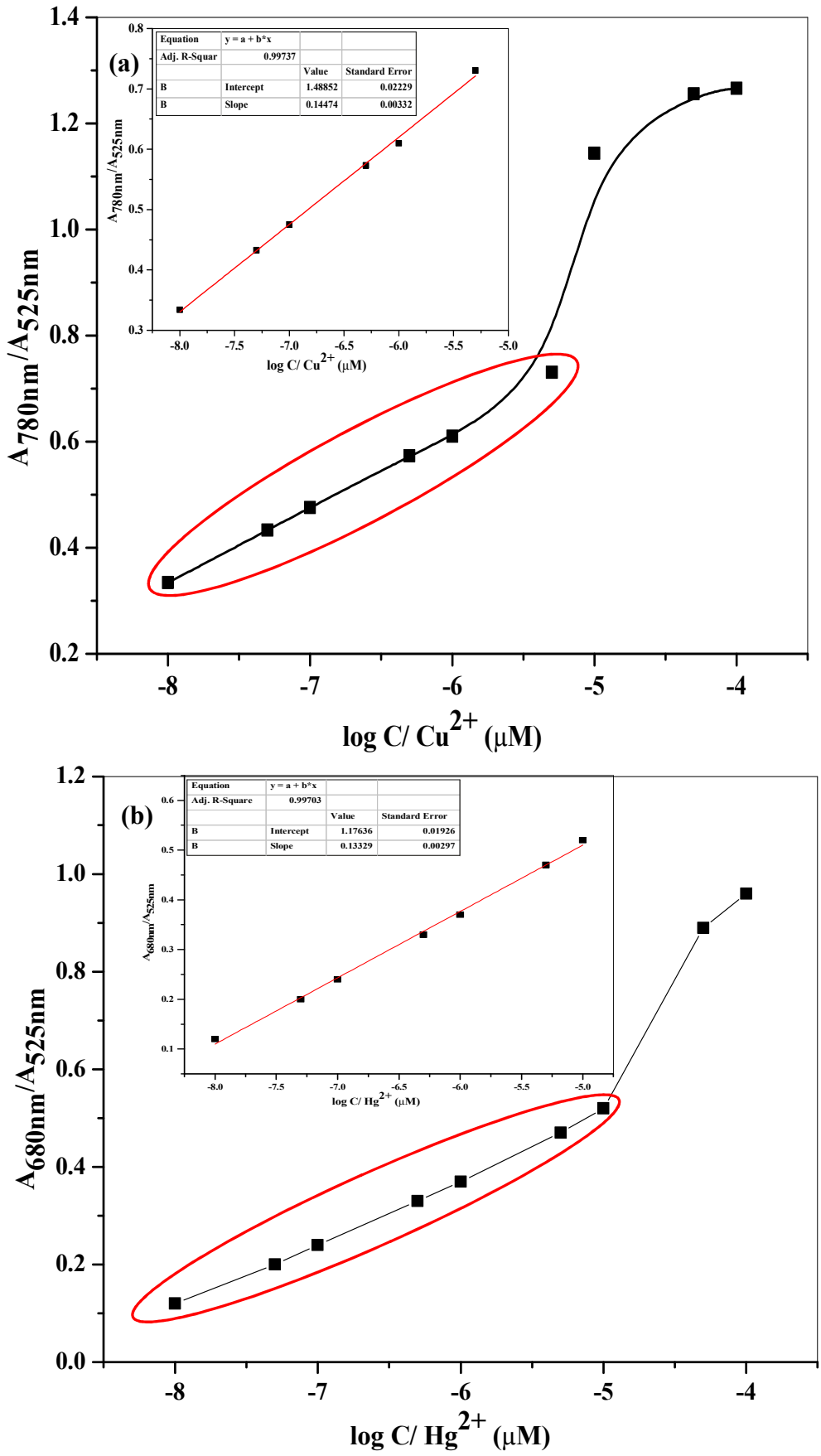


Figure S8. Calibration graphs between the absorption ratio at (a) A_{780nm}/A_{525nm} and concentration of Cu^{2+} and (b) A_{680nm}/A_{525nm} and concentration of Hg^{2+} by using MA-DTC-Au NPs as a colorimetric probe.

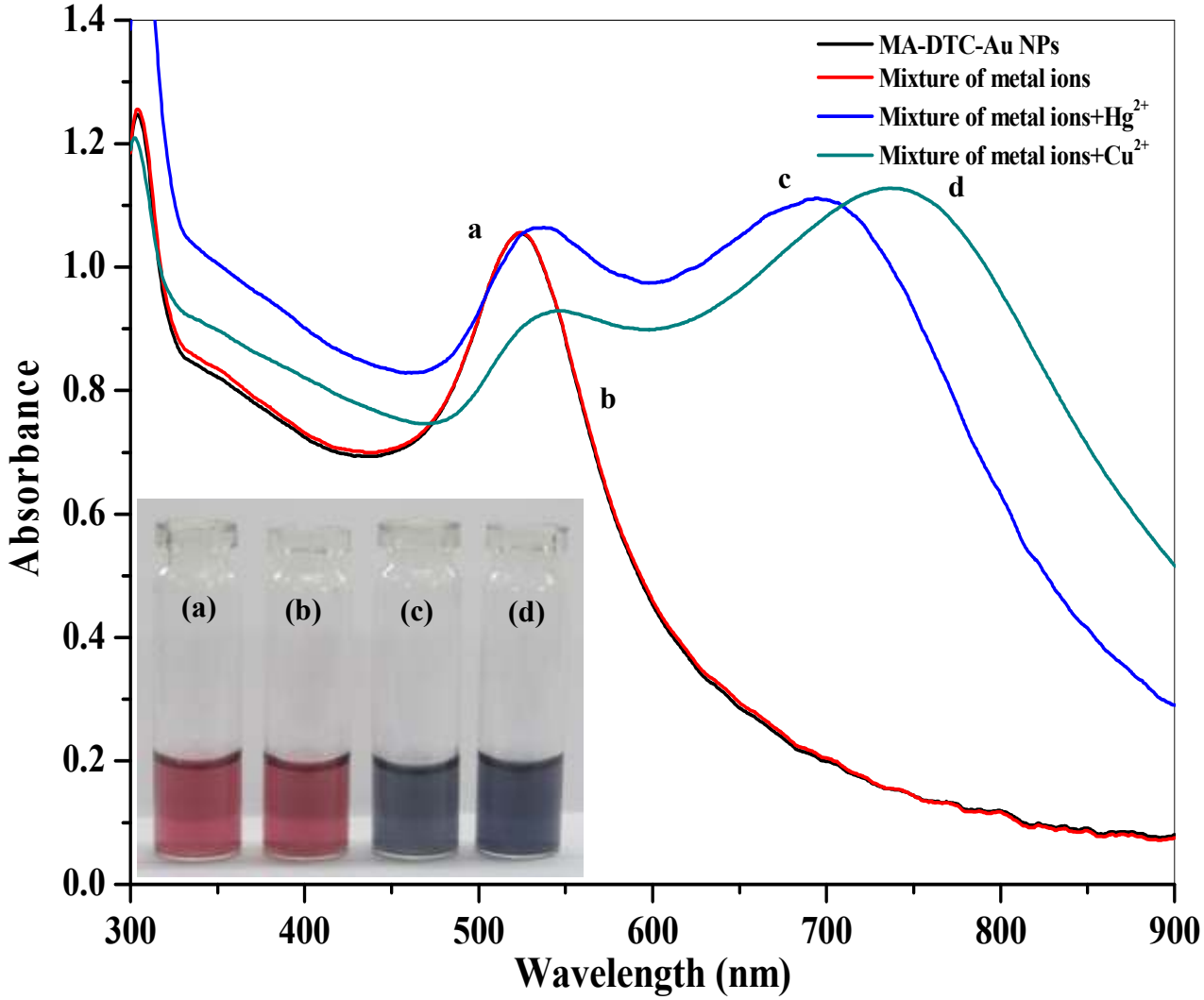


Figure S9: UV-visible spectra of (a) MA-DTC-Au NPs (b) MA-DTC-Au NPs in the presence of different metal ions (Al^{3+}, Ca^{2+}, Cd^{2+}, Co^{2+}, Fe^{2+}, Fe^{3+}, Mg^{2+}, Mn^{2+}, Ni^{2+}, Pb^{2+}, Zn^{2+}). without Cu^{2+} and Hg^{2+} ion (c) MA-DTC-Au NPs in the presence of Hg^{2+} ion and (d) MA-DTC-Au NPs in the presence of Cu^{2+} ion along with different metal ions (Al^{3+}, Ca^{2+}, Cd^{2+}, Co^{2+}, Fe^{2+}, Fe^{3+}, Mg^{2+}, Mn^{2+}, Ni^{2+}, Pb^{2+}, Zn^{2+}).