Supporting information

Facile and rapid synthesis of dithiol-protected Ag_7 quantum cluster for selective adsorption of cationic dyes

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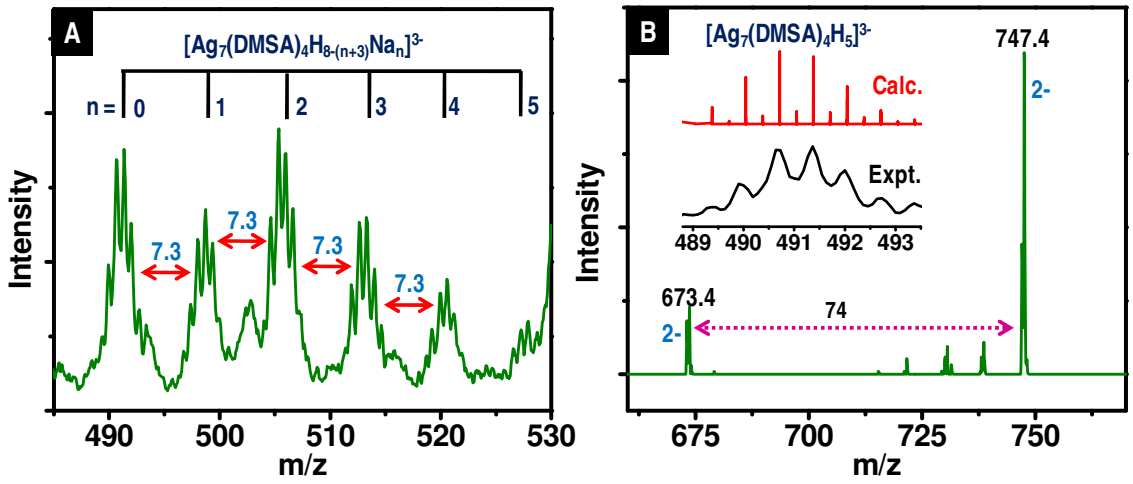

Figure S1. A) ESI MS of as-synthesized silver clusters (in 1:1 water-methanol) in the –ve mode. Peaks corresponding to sodium adducts of triply charged ion are shown above the spectrum. B) MS^2 of m/z 747.4 at a collision energy of 15 eV. Inset of B is a comparison of the calculated and experimental peaks of $[Ag_7(DMSA)_4H_5]^{3-}$.

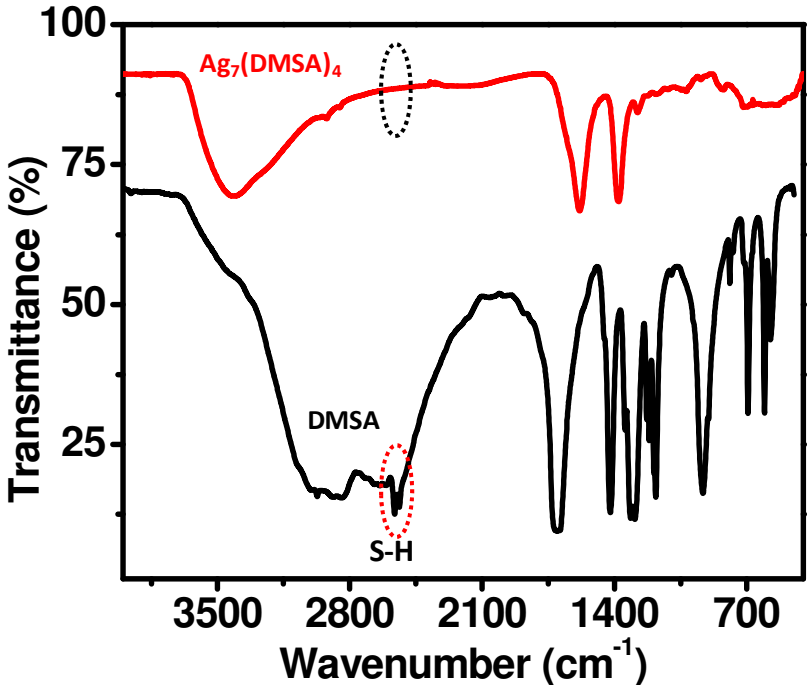

Figure S2. Comparison of FTIR spectra of the ligand, DMSA (black trace) and silver cluster (red trace). Region of S-H stretching frequency (around 2550 cm^{-1}) is marked with dotted ellipses in both the spectra. Absence of S-H stretching frequency in the cluster confirms the binding of both the thiols of DMSA on the Ag cluster.

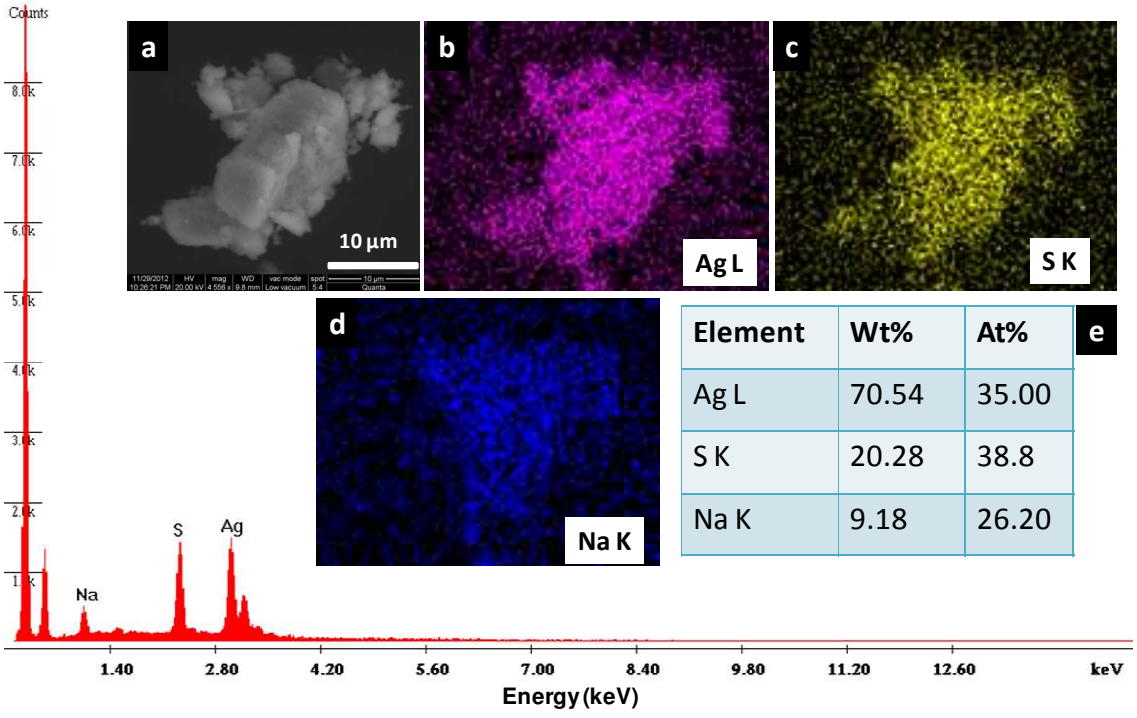

Figure S3. SEM-EDAX spectrum of silver clusters. Insets show the SEM image of an aggregate of clusters and elemental maps of Ag, S and Na (a, b, c and d, respectively). Quantification table of elements is also seen (inset e).

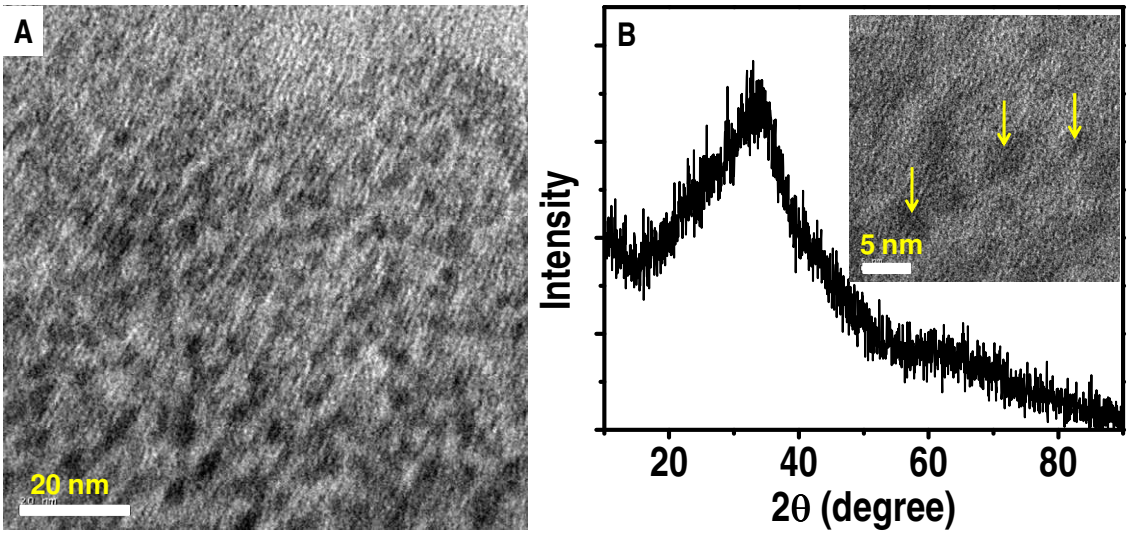

Figure S4. TEM image (A) and XRD pattern (B) of silver clusters. Inset of B is a small area TEM image of clusters after 4 min. of exposure to the electron beam. Arrows indicate regions where the growth of clusters to aggregates, due to irradiation of electron beam, has taken place. Due to electron beam-induced aggregation, TEM is not a good tool to understand such sensitive clusters.

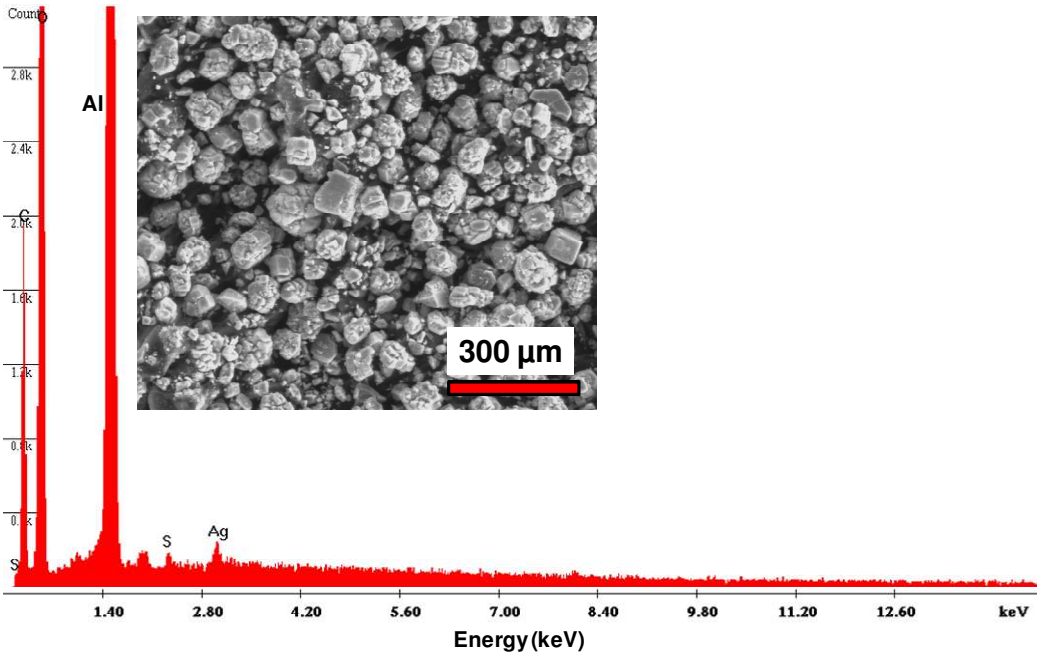

Figure S5. SEM-EDAX spectrum of silver clusters loaded on alumina showing the presence of Ag and S from clusters. Inset is a large area SEM image of the same sample.

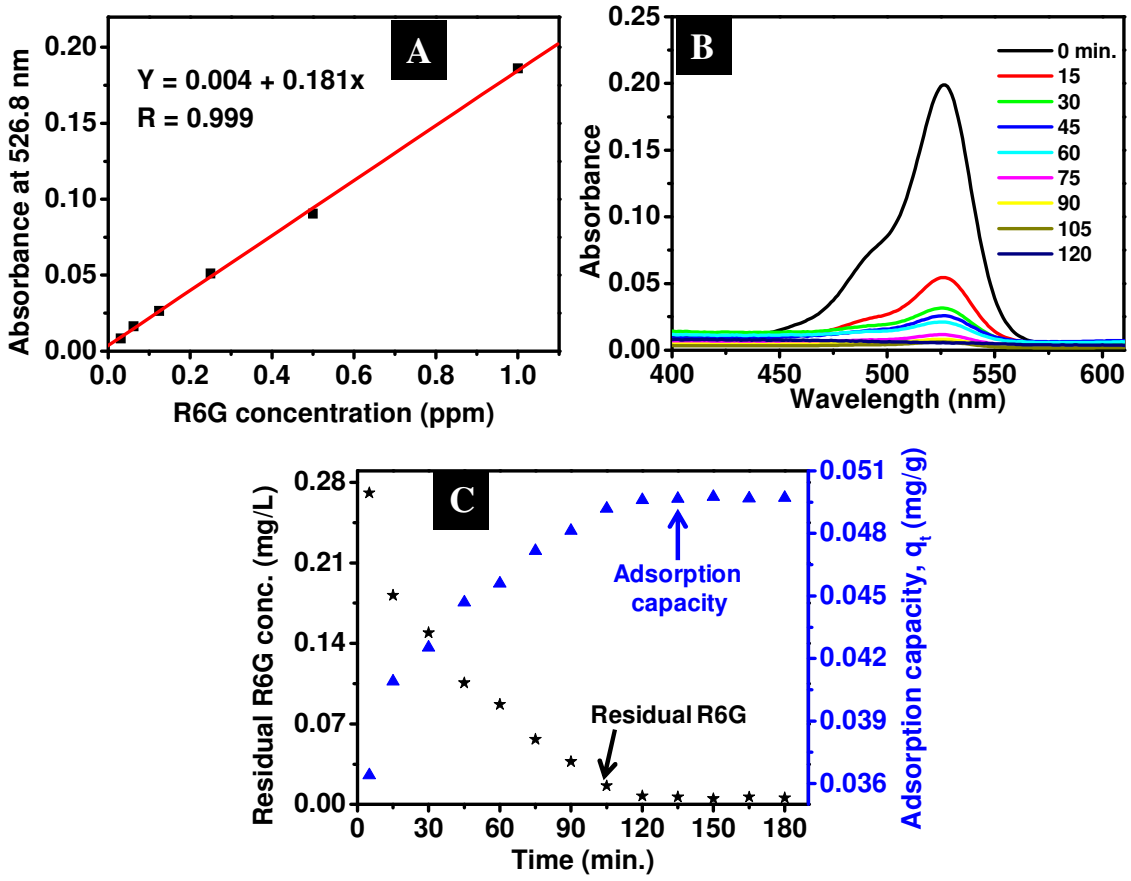

Figure S6. A) Calibration curve for R6G concentration. B) UV/Vis absorption spectra of residual R6G in dye solutions after treating with supported clusters. C) Plots of residual R6G and adsorption capacity (q_t, mg/g) with time. The kinetics followed pseudo first and second orders.

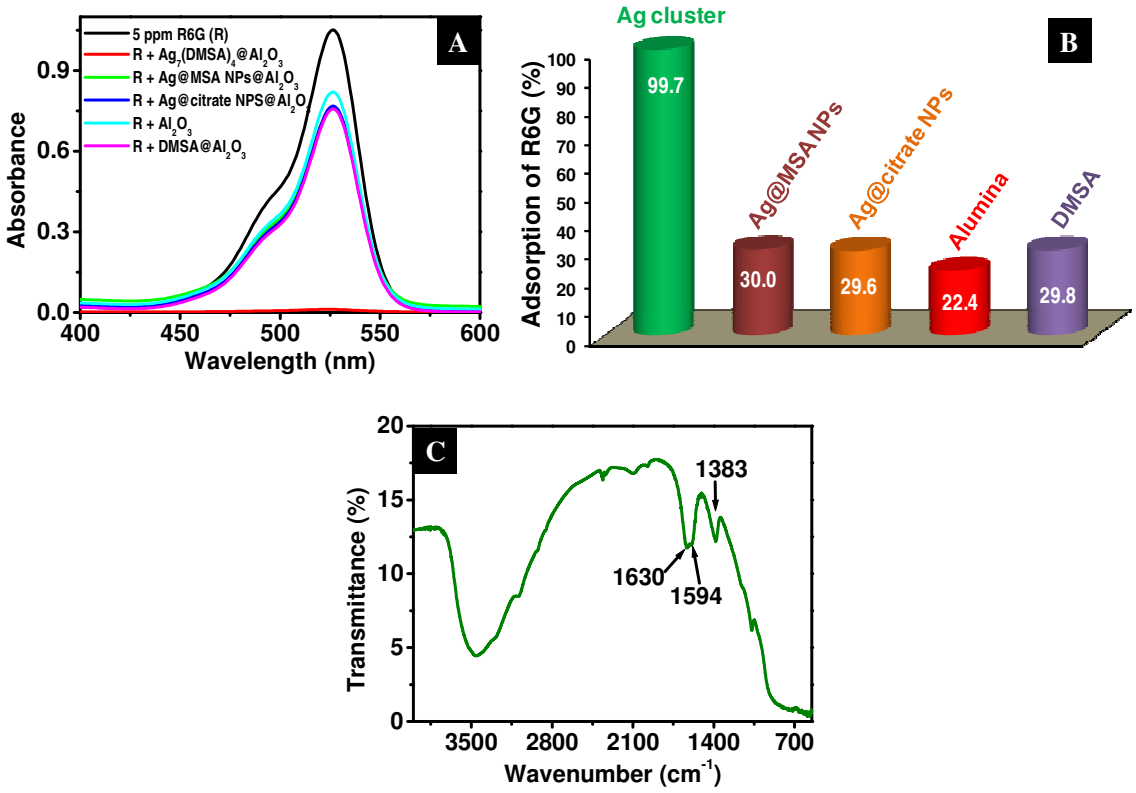

Figure S7. A) UV/Vis absorption spectra of residual R6G after treating with support (alumina), supported clusters, supported ligand, DMSA and supported silver nanoparticles protected with citrate and MSA. B) Histogram of % removal from 3 mL, 5 ppm R6G by supported nanomaterials. C) FTIR spectrum of DMSA supported on alumina.

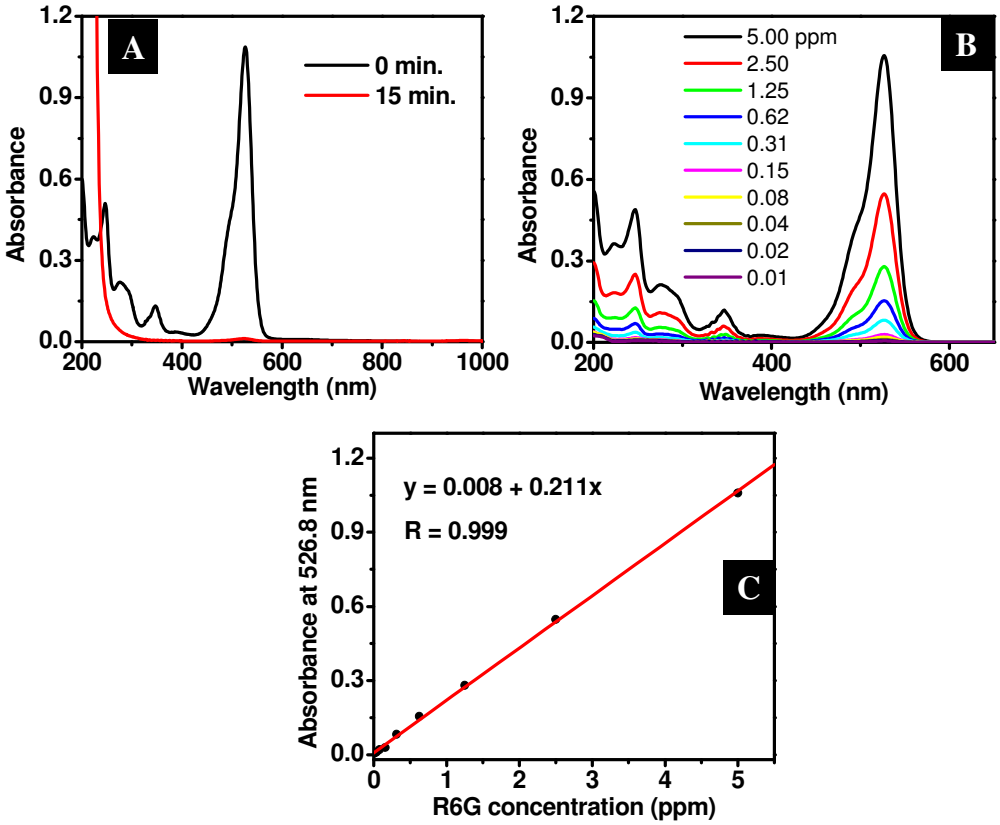

Figure S8. A) UV/Vis absorption spectra of residual R6G in the dye solution after treating with 500 mg of supported silver cluster for 0 and 15 min. B) UV/Vis absorption spectra solutions of R6G with different concentrations. Absorbance values at 526.8 nm are used for constructing calibration graph. C) Calibration plot for R6G.