

Supporting Information

A novel *nanoaggregation* detection technique of TNT using selective and ultrasensitive nanocurcumin as a probe

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Experimental Section:

Materials: Curcumin, picric acid (PA), acetonitrile, and ethanol were purchased from Sigma-Aldrich and used without further purification. 2,4,6-Trinitrotoluene(TNT), Cyclotrimethylenetrinitramine (RDX), HMX, Pentaerythritol tetra nitrate (PETN) was provided in less amounts with 100 % purity by Commissioner of Police, Ahmedabad, Gujarat. Freshly prepared plant extracted turmeric powder is used. UV-Vis absorption spectra were acquired on a Jasco V-570 UV-Vis spectrometer. The fluorescence spectrum was obtained by Hitachi F-2000 fluorescence spectrophotometer. IR spectra were measured with a Bruker Tensor 27 FT-IR spectrometer. Transmission electron micrograph (TEM) was recorded by JEOL, JEM-2100(200 kV). DLS measurements were performed using Nanotracs instrument. pH measurement were made by using model EQ-664 (Equip-tronics).

Curcumin nanoparticles preparation: Ball milling is the most commonly used method to prepare such materials, because it can reduce grain size. Bulk particle of turmeric were synthesized using standard solid state reaction technique by top down approach. The curcumin powder is pre-heated at 1000 °C for 12 h for calcination. The calcinated powder was pressed into pellets and sintered at 1300 °C for 24 h followed by slow cooling to room temperature. To prepare curcumin nanoparticles, 10 gm of final material was used for milling in high energy ball mill(SPEX 8000D) . The balls to powder mass ratio was kept 10:1. The powder was milled in air at room temperature without additive under closed milling condition and the powder was milled for 5 h. The average particle size was found to be ~52 nm. The curcumin nanoparticles structure is characterized by FT-IR spectroscopy in which FT-IR spectrum shows frequency of aromatic $-(OH)3354\text{ cm}^{-1}$, $(-C=O)1675\text{ cm}^{-1}$.Spectral analysis for the developed nanoparticles were observed by UV-Vis spectroscopy with absorption maximum at 419 nm.

Detection of TNT: The stock solution of TNT (0.1 M) was prepared by dissolving TNT(0.22 g) in deionized water. A solution of nanocurcumin (0.1 M) was prepared and further it was diluted. Colorimetric detection of TNT was carried out using 0.2 mM solution of curcumin nanoparticles. For optimization, the different concentrations of TNT were prepared by adding 4:1 EtOH/ACN solution to get TNT concentrations in the range of 1 nM to 1 μ M. Samples of other nitro explosives were prepared in the concentration range of 1 nM to 1 μ M from the stock solution of 0.1M. The UV-Vis absorption spectra of interacted TNT-curcuminNp were recorded at maximum absorption (462 nm) and the fluorescence spectrum was measured of the same solution with excitation wavelength at 310 nm and emission wavelength at 625 nm. To study the effect of pH 0.025 M potassium dihydrogen orthophosphate (KH_2PO_4) buffer solution was made. Further 0.2 % orthophosphoric acid was added to get acidic pH solution from 3.5 to 6.5 and To make basic pH solution ,0.2% triethylamine was added to maintain pH (8 -12).

Fig S1

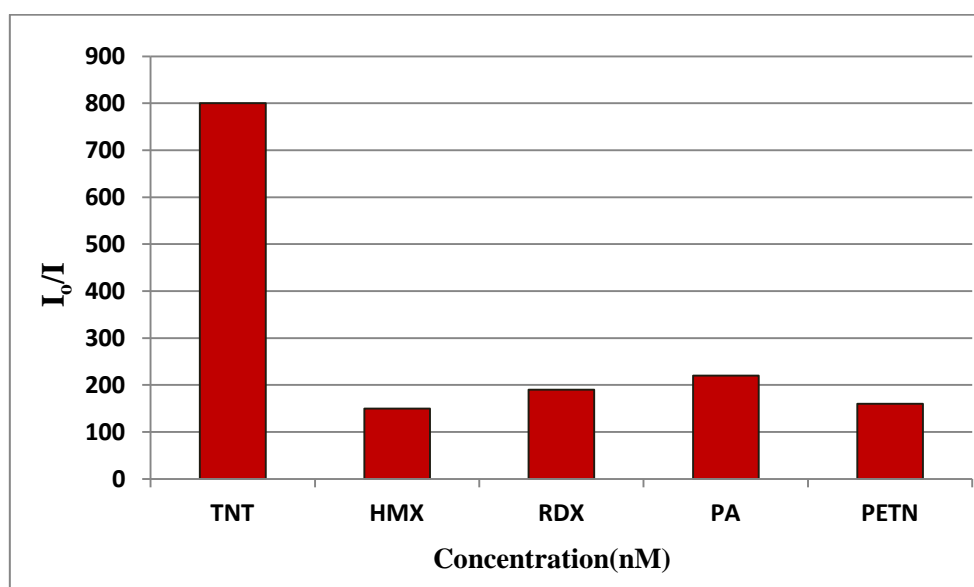


Fig. S1 Fluorescence emission spectral changes of curcumin nanoparticles in the presence of RDX, HMX, PETN ,PA and TNT

Fig. S2

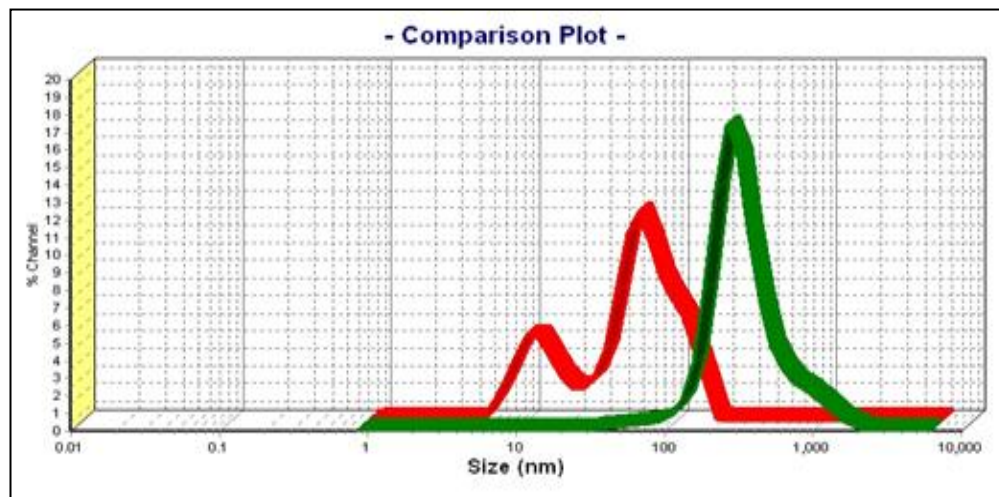


Fig. S2 Comparison plot of DLS measurement without and with addition of 0.1 mM TNT into the curcumin nanoparticles