

## Supporting Information

# Ultrasound-driven Fabrication of Hybrid Magnetic Tryptophan Nanoparticles

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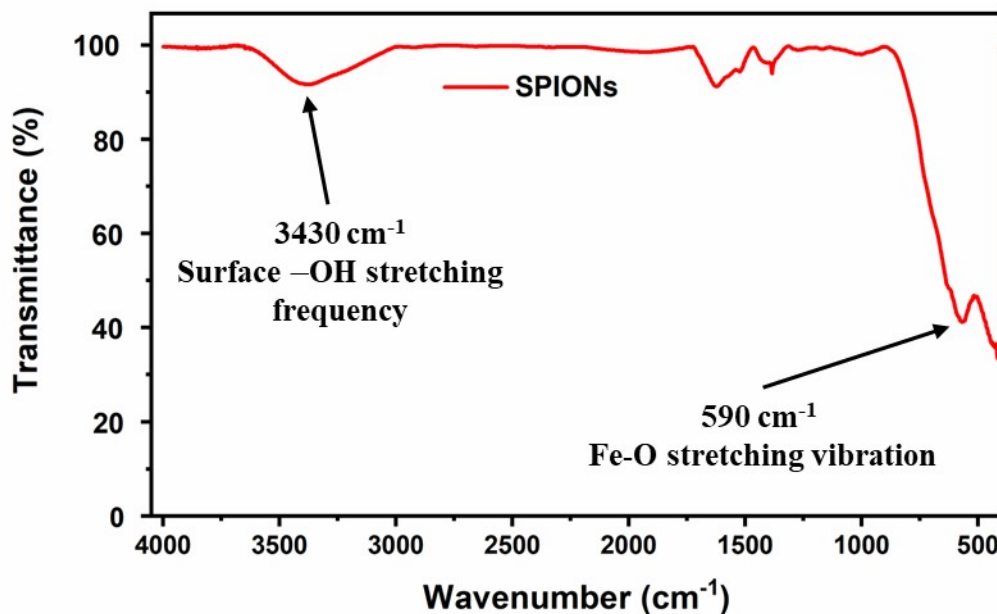
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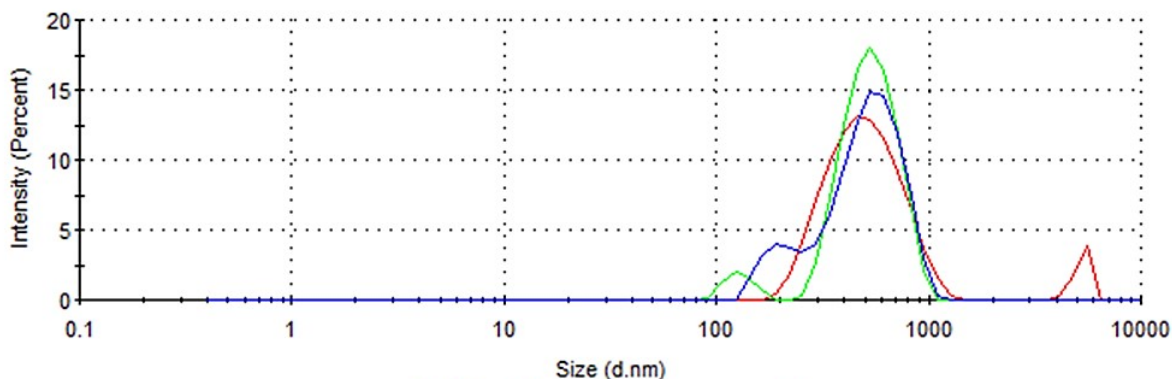
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## 1. Fourier-transform infrared spectroscopy (FTIR) spectra of SPIONs



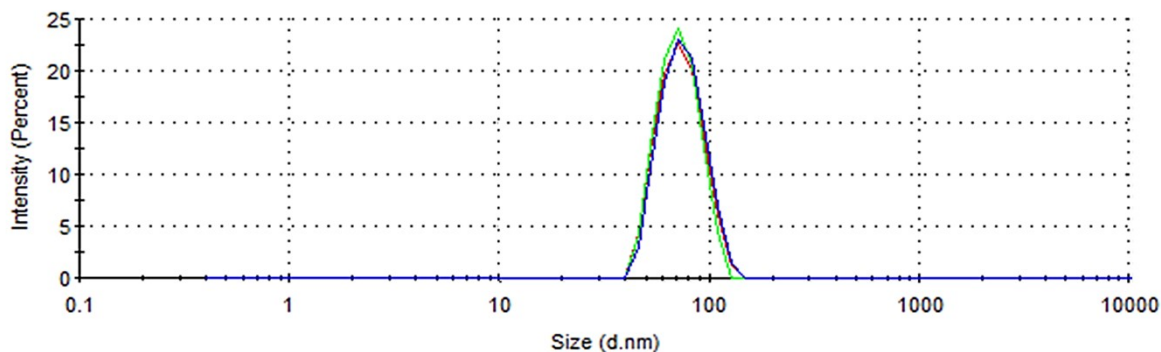
**Figure S1:** FTIR analysis depicting the characteristics peaks of SPIONs.

## 2. Measurement of the particle size distribution of pristine SPIONs and tryptophan surface modified-SPIONs using dynamic light scattering (DLS)



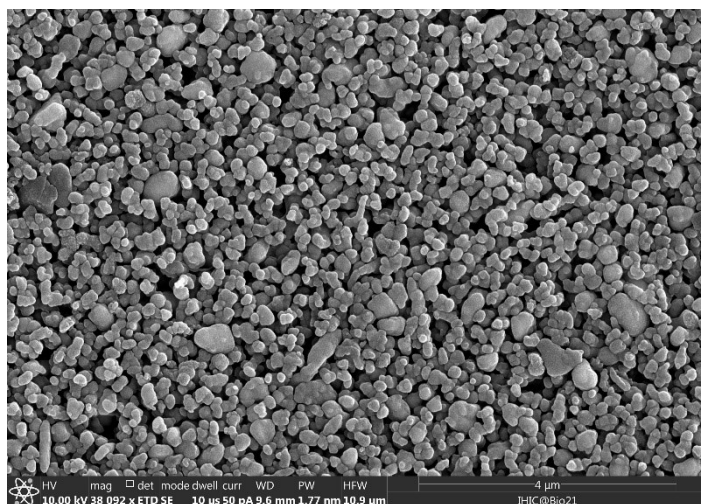
**Figure S2:** Particle size measurement of pristine SPIONs at 0.5 mg/mL in MilliQ water (pH 7.4) depicting the formation of large aggregates with a size of around 500 nm compared to the particle size measured from TEM images. It describes the colloidal instability of pristine SPIONs and the

need for surface modification. (Different colours indicate the several measurements taken from the sample)



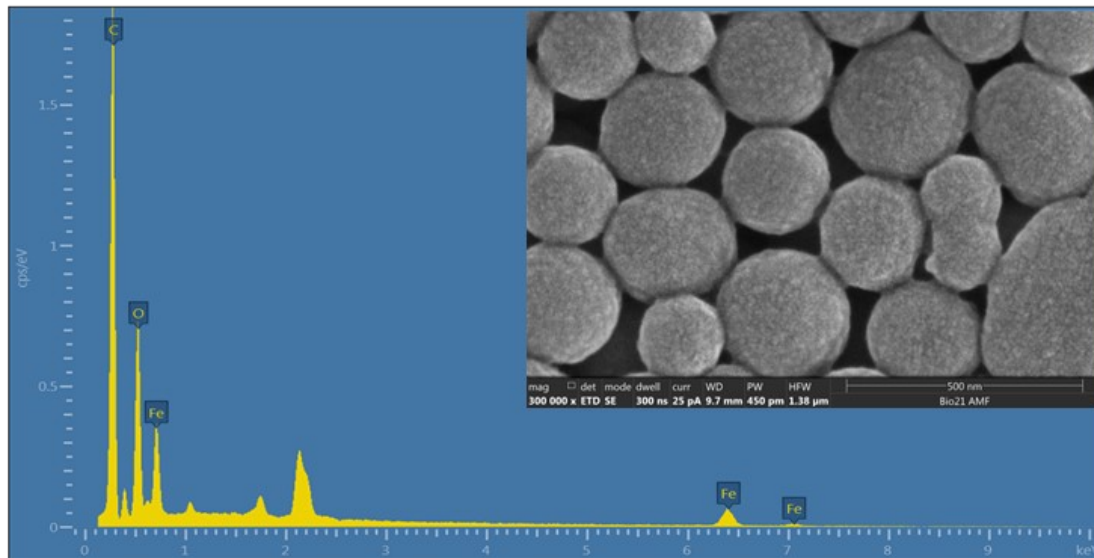
**Figure S3:** Particle size measurement of surface-modified SPIONs using tryptophan showing the formation of smaller particle size with better colloidal stability. (Different colours indicate the several measurements taken from the sample)

### 3. SEM images of magnetically functionalised tryptophan nanoparticles (MTNs)



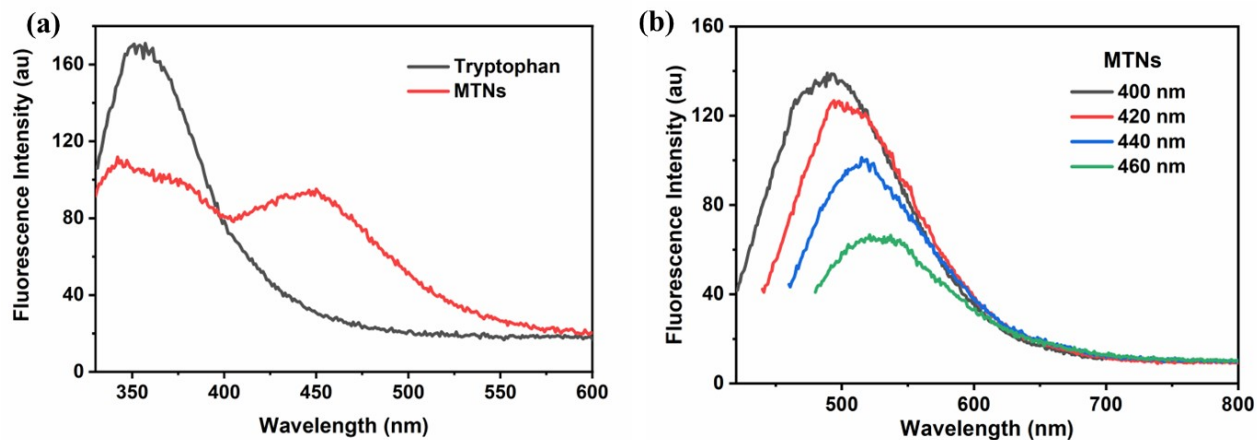
**Figure S4:** SEM image of the MTNs, which were stored for 6 months and dispersed in MilliQ water with ultra-sonification in an ultrasound bath before preparing the sample for SEM. The image depicts that the particles can be stored in solid powder form for an extended period and resuspended in solution form with their morphology intact.

#### 4. SEM coupled with energy-dispersive X-ray spectroscopic (SEM-EDS) analysis of MTNs

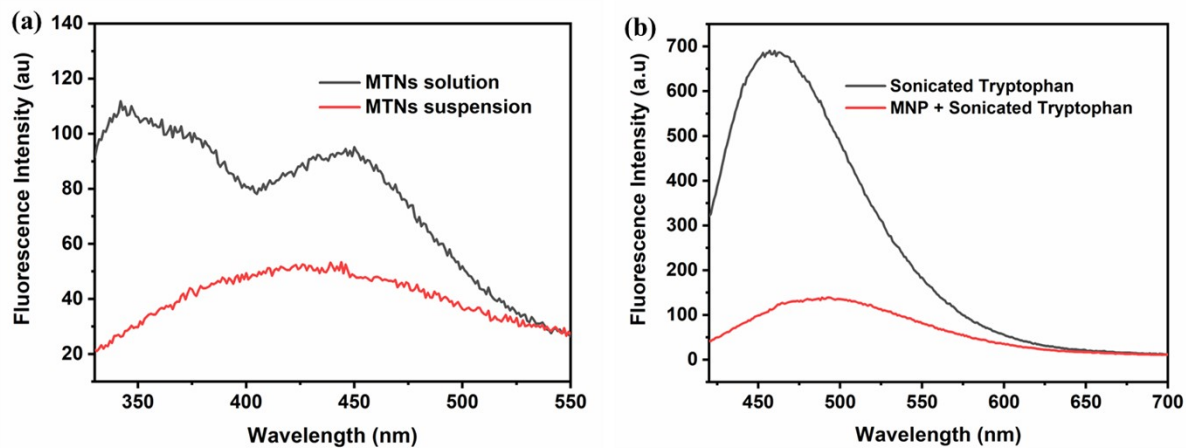


**Figure S5:** SEM-EDS spectra of MTNs confirming the successful incorporation of SPIONs in nano-assemblies of tryptophan-matrix.

#### 5. Fluorescence spectroscopic analysis of MTNs

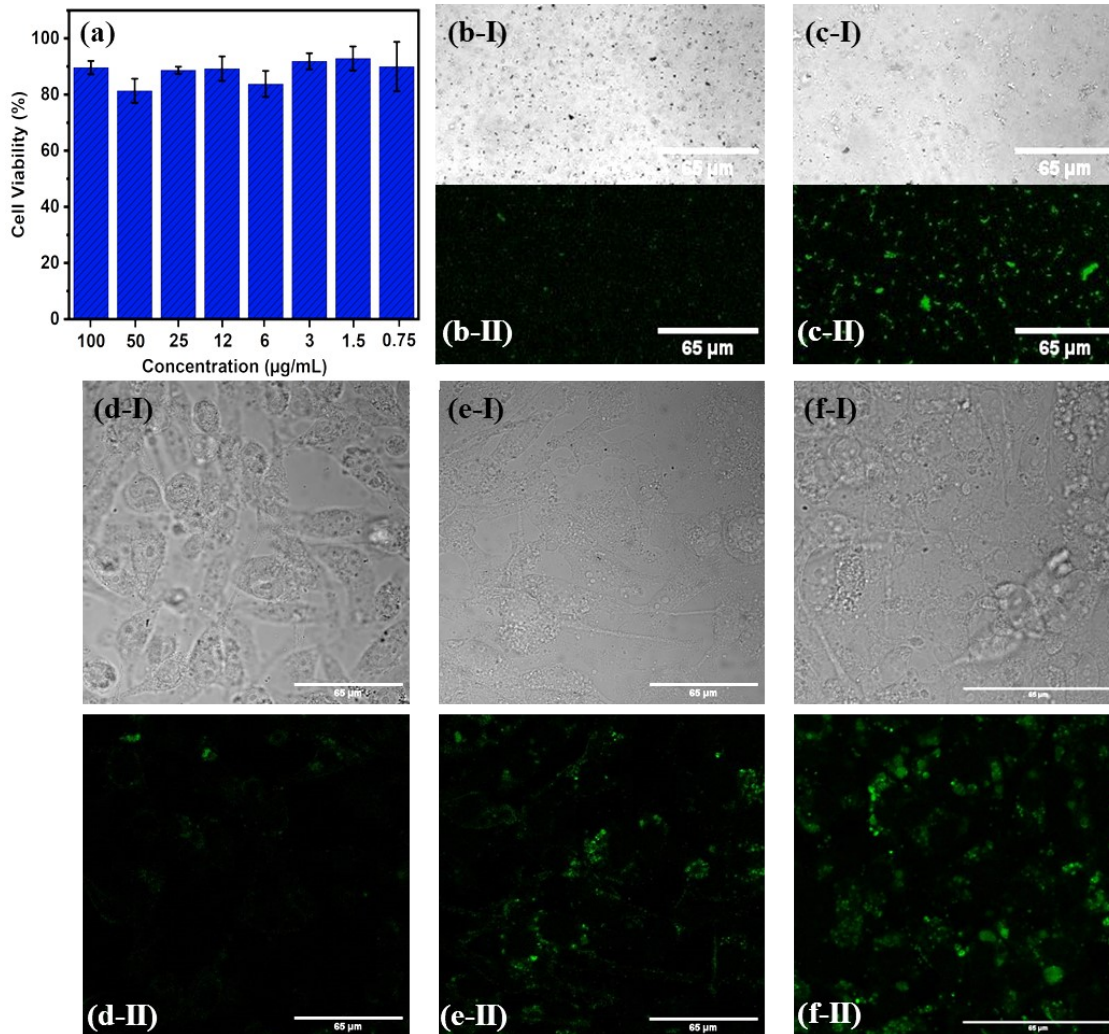


**Figure S6:** Fluorescence emission spectra depicting (a) the comparison between untreated tryptophan and MTNs solution when excited at 300 nm and (b) shift in emission peaks when excited from 400 nm to 460 nm.



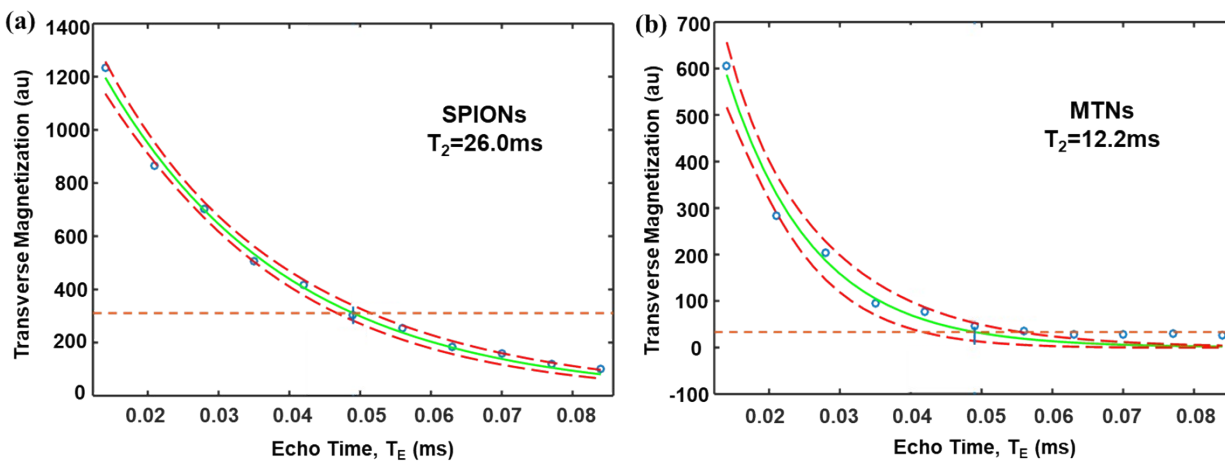
**Figure S7:** Fluorescence emission spectra of (a) MTNs solution and MTNs suspension solution in MilliQ water (excited at 310 nm), and (b) sonicated tryptophan solution and added SPIONs to the sonicated tryptophan solution (excited at 400 nm).

## 6. Fluorescence Intensity measurement and Dissolution study



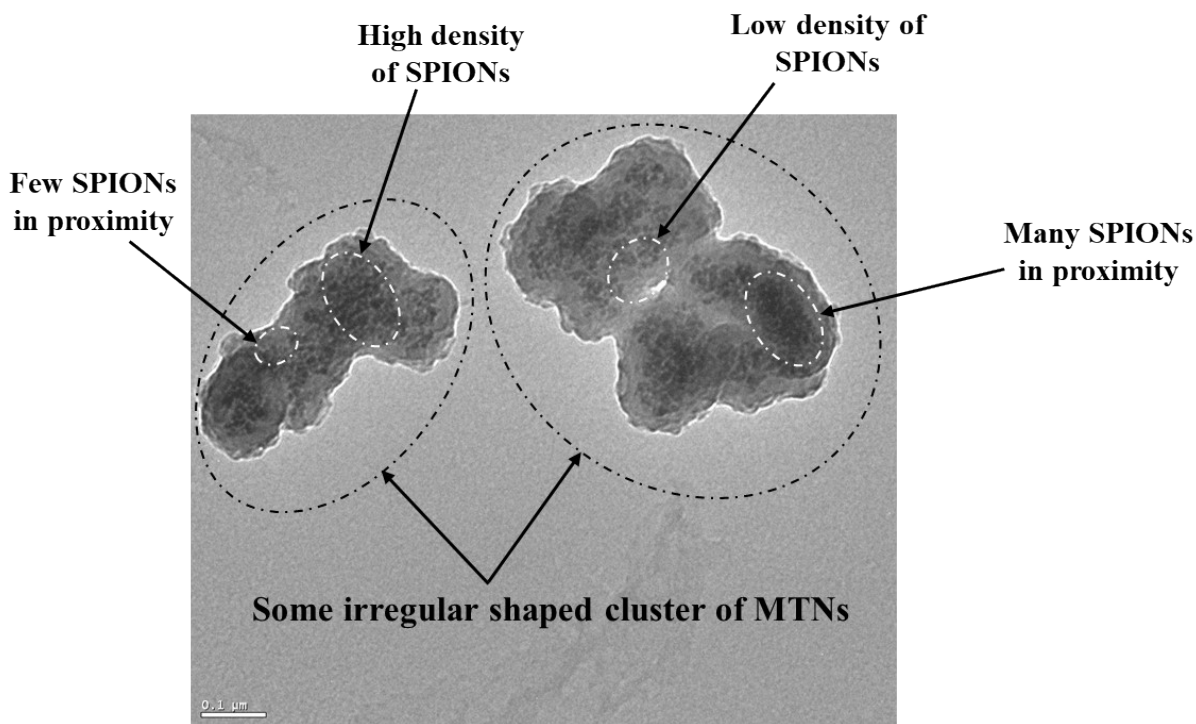
**Figure S8:** (a) Cytotoxicity test performed using MDA-MB-231 cell line after 24 h incubation with MTNs. Confocal imaging of freshly prepared (1h incubation at 100  $\mu\text{g/mL}$ ) (b) MTNs solution and (c) TNs solution, Confocal imaging of MTNs incubated with MDA-MB-231 cell (unbounded MTNs washed out after 6h) line acquired at (d) 6h, (e) 12h, and (f) 24h of incubation time. The confocal images were captured in (I) bright field channel and (II) green channel.

## 7. MRI Analysis



**Figure S9:** Transverse relaxation curve for investigating the  $T_2$  relaxation time of (a) SPIONs, and (b) MTNs, when subjected to a strong magnetic field at the same concentration.

## 8. TEM images of MTNs



**Figure S10:** TEM image depicting the inhomogeneous distribution of SPIONs within the tryptophan matrix and the cluster size and shape variations.