

Electronic Supplementary Information

Sonication-enabled Rapid Production of Stable Liquid Metal Nanoparticles Grafted with Poly(1-octadecene-*alt*-maleic anhydride) in Aqueous Solutions

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Keywords: Liquid metal; EGeIn; Nanoparticles; Functional material; Sonication

CEBD of the LM NPs

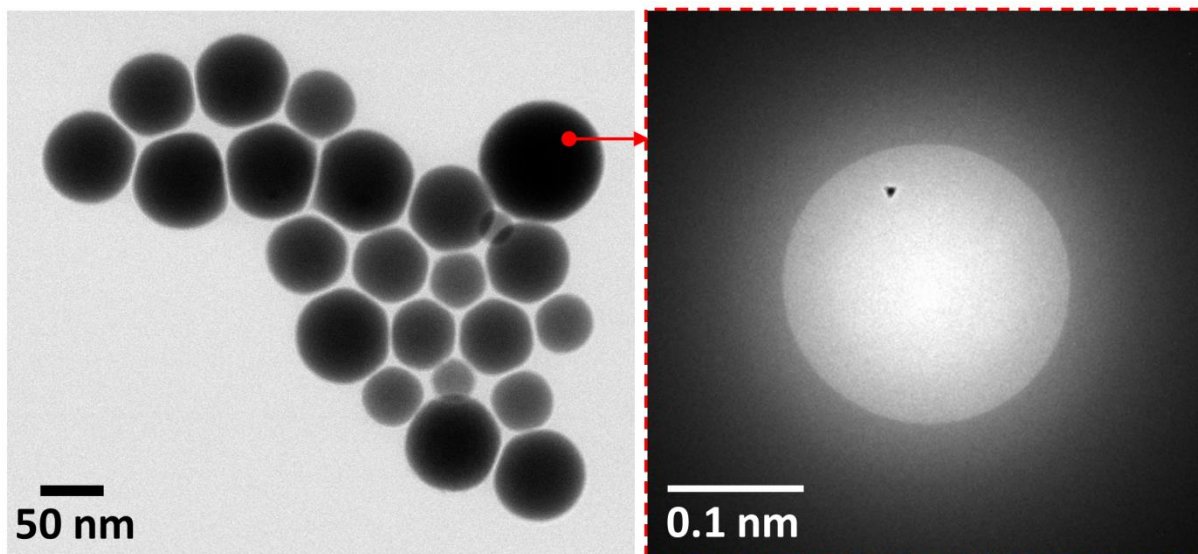


Figure S1. TEM and CBED images of the EGaIn NP. No diffraction pattern can be observed, indicating that NPs remains in a liquid state.

Investigating the Thickness of the POMA Polymer Coating

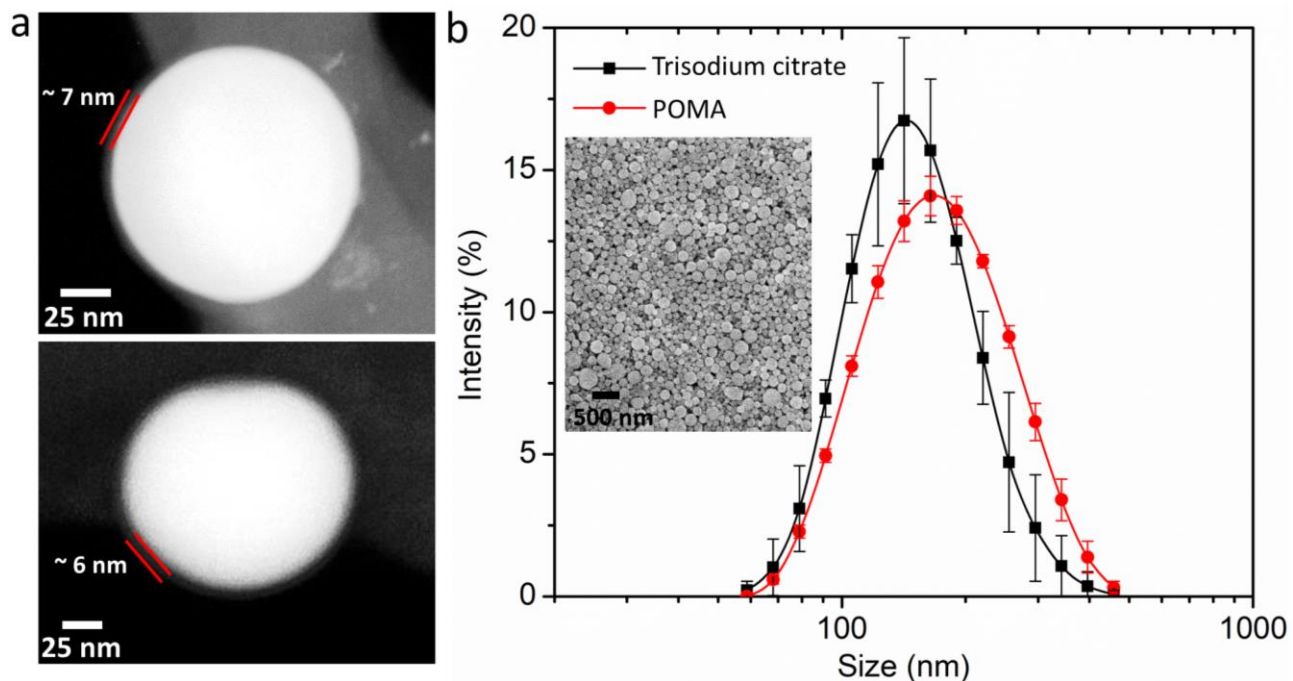


Figure S2. (a) Representative HAADF images of the POMA grafted LM NPs on a TEM grid coated with a lacey carbon film. (b) Hydrodynamic size distributions of the trisodium citrate and POMA coated EGaIn NPs within DI water; the inset shows the SEM image of the trisodium citrate coated LM NPs.

Control Experiments

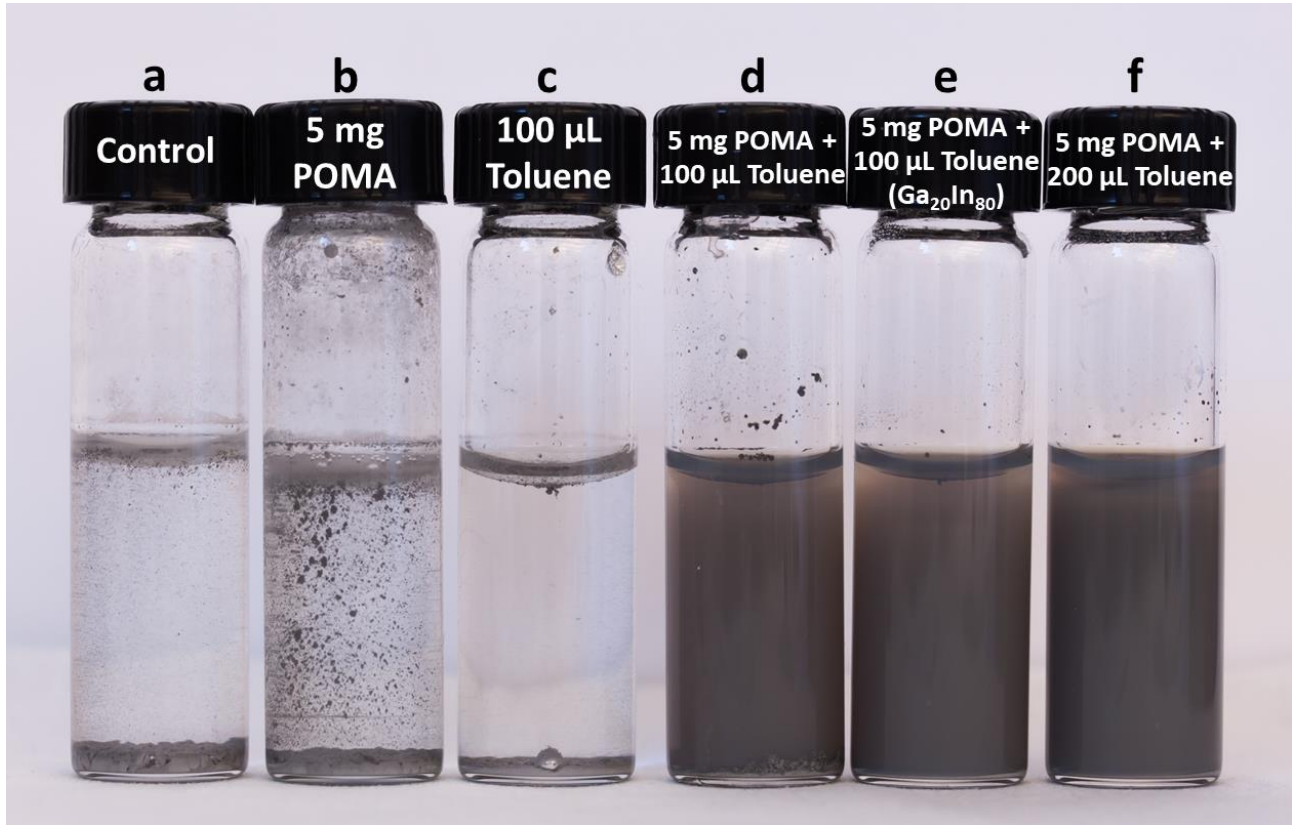


Figure S3. Liquid metal NP suspension 48 h after production using a) 50 μL EGaIn + 5 mL DI water, b) 50 μL EGaIn + 5 mL DI water + 5 mg POMA, c) 50 μL EGaIn + 5 mL DI water + 100 μL toluene, d) 50 μL EGaIn + 5 mL DI water + 5mg POMA + 100 μL Toluene, e) 50 μL Ga₂₀In₈₀ + 5 mL DI water + 5 mg POMA + 100 μL Toluene, and f) 50 μL EGaIn + 5 mL DI water + 5 mg POMA + 200 μL Toluene.

Brushed polyethylene glycol (bPEG) grafted EGaIn NPs

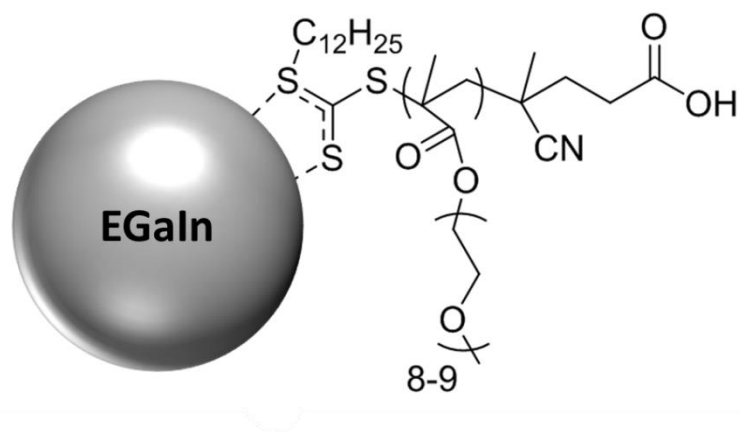


Figure S4. Scheme of the conjugation between bPEG molecules and EGaIn particle [1].

EDS spectrum for PMVEMA grafted EGaIn NPs

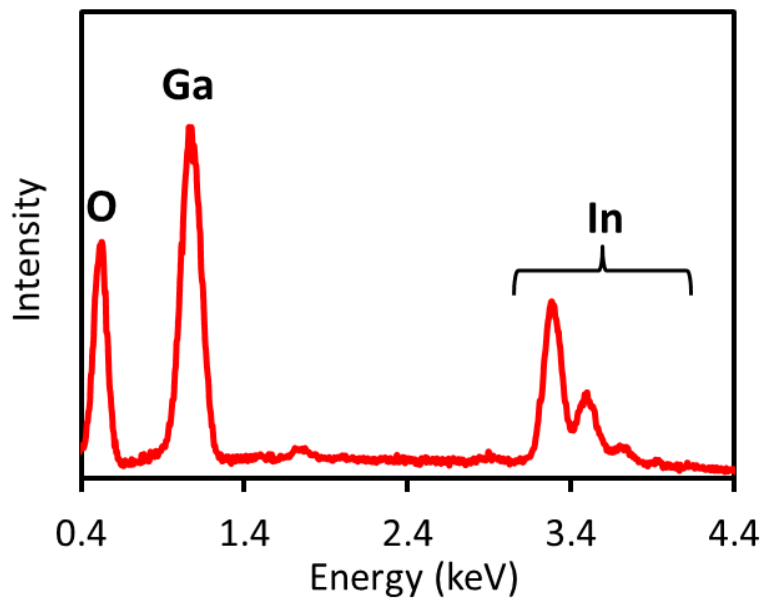


Figure S5. EDS spectrum for PMVEMA grafted EGaIn NPs 5 days after production.

POMA Grafted LM NPs in HCl Acid

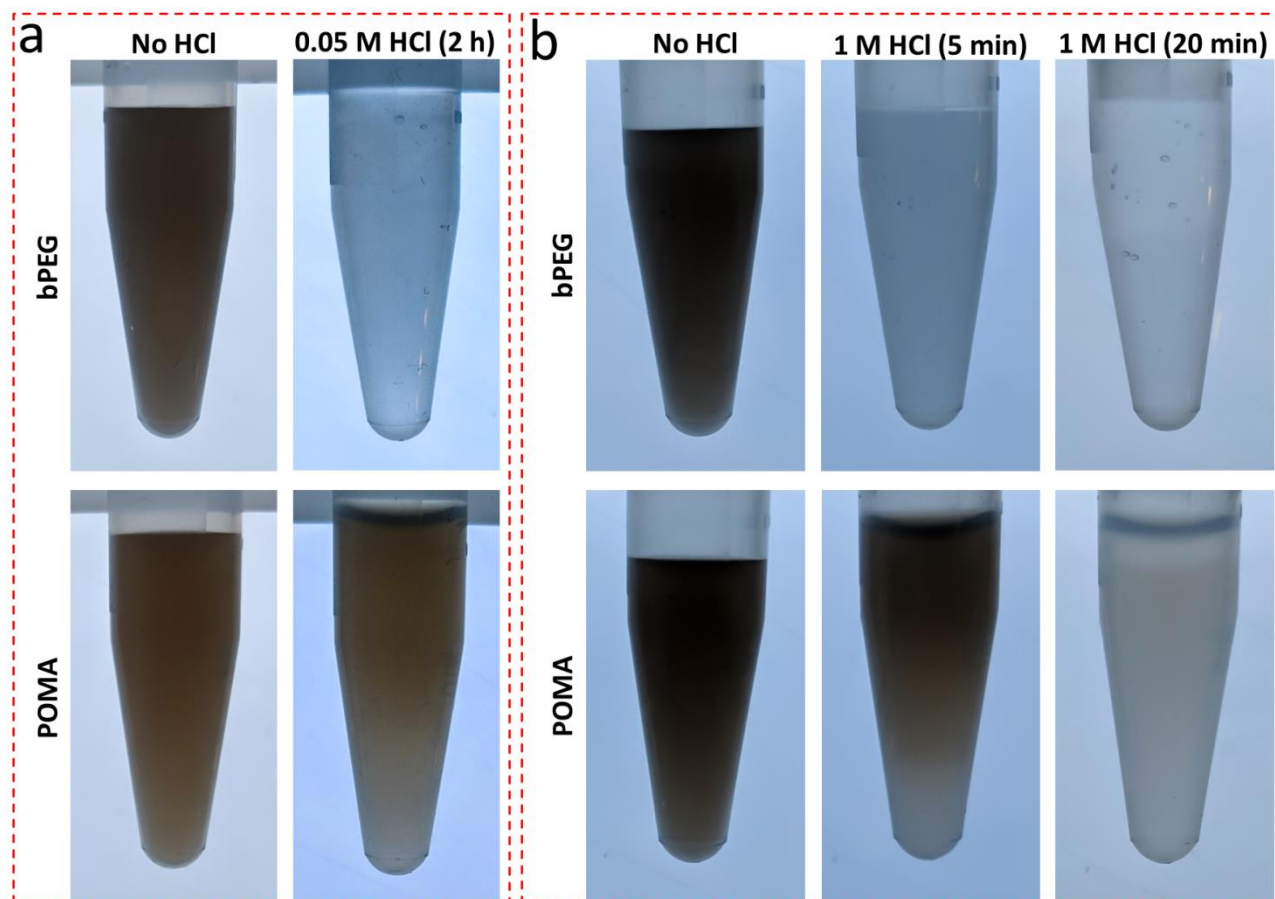


Figure S6. Images of bPEG and POMA grafted LM NPs before and after adding HCl solution to yield a concentration of (a) 0.05 M, and (b) 1 M. It is clear that the hydrophobic insulating layer on POMA grafted NPs can significantly enhanced the resistance of etching from strong acid.

Grafting other NPs with POMA

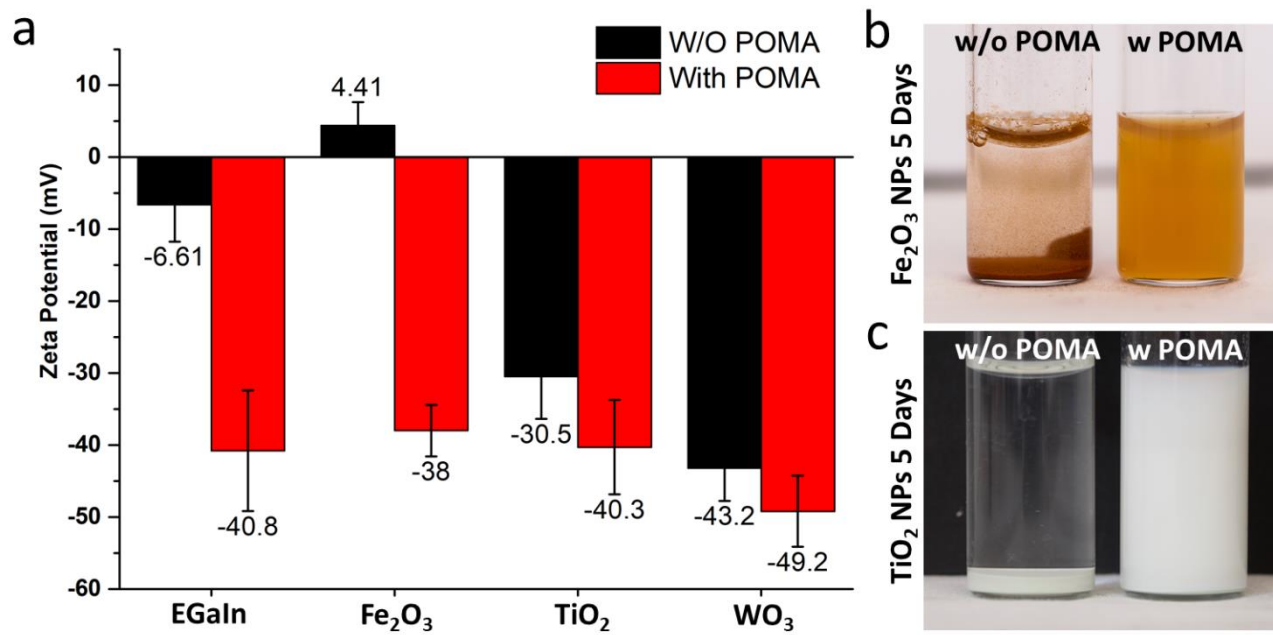


Figure S7. a) Zeta potential obtained for EGaIn, Fe₂O₃, TiO₂, WO₃ NPs produced using sonication with or without POMA grafting. b) Fe₂O₃ NP, and c) WO₃ suspension with or without POMA grafting 5 days after sonication.

Stability of POMA grafted EGaIn NPs in 1-3× PBS buffers

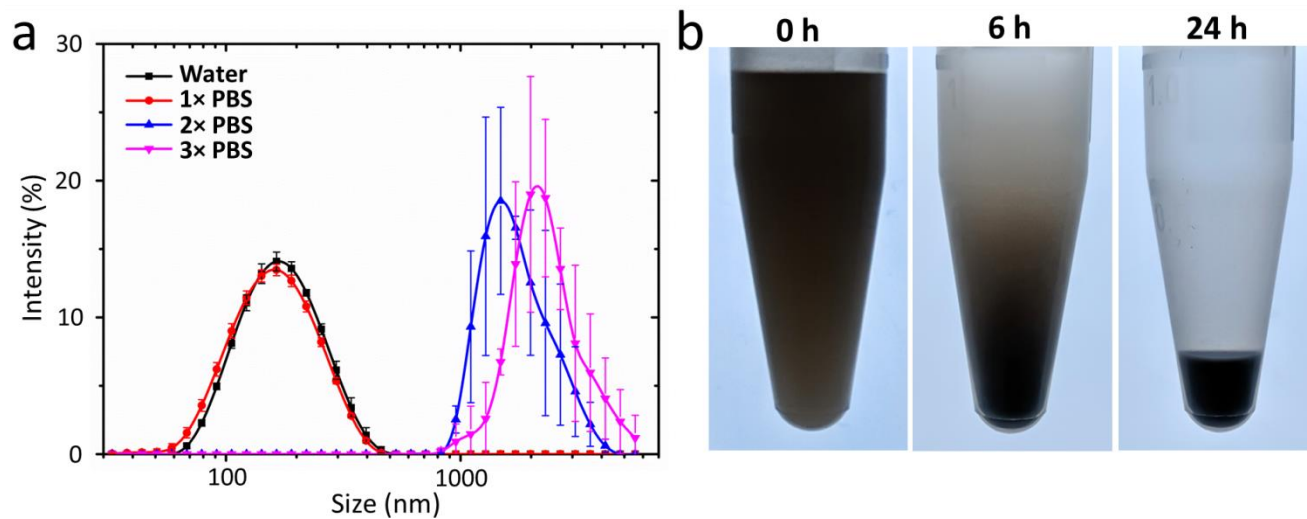


Figure S8. (a) Hydrodynamic size distribution of the POMA grafted EGaIn NPs within 1×, 2× and 3× PBS buffers. (b) Precipitation of LM NPs in 3× PBS buffer over a period of 24 h.

Cytotoxicity of the POMA Grafted LM NPs

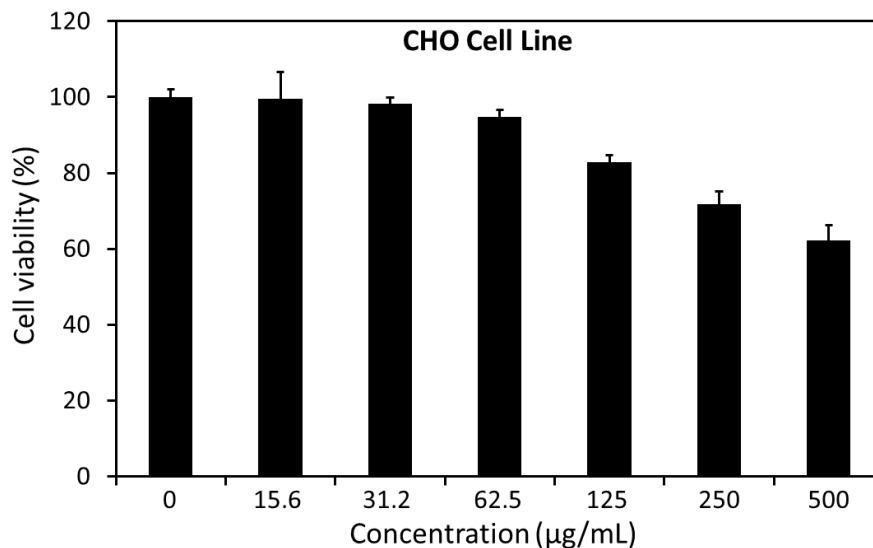


Figure S9. The effect of concentration for NPs grafted with POMA on the survival rates of CHO cells.

CHO cells were grown in Dulbecco's Modified Eagle Media (DMEM) culture media with 10% Fetal Bovine Serum (FBS). CHO cells (1×10^4 cells/well) were exposed to the LM NPs with different concentrations for 24 h in 96-well plates, with the final volume of 100 μ L. Cell culture medium was used as a control. After exposure, we removed the suspensions and incubated the cells with 10% Alamar Blue (Invitrogen) for 4 h at 37 $^{\circ}$ C. We used a microplate reader (CLARIOstar, BMG LABTECH) to read the fluorescence at 500 nm (excitation) and 530 nm (emission). Background values (10% Alamar Blue in cell culture medium) were subtracted from each well and the average fluorescent intensity of the triplicates was calculated.

References

1. S.-Y. Tang, R. Qiao, S. Yan, D. Yuan, Q. Zhao, G. Yun, T. P. Davis, W. Li, *Small*, 2018, **14**, 1800118.