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# Synthesis of a stable iron oxide nanoparticles in ionic base fluid for photo-thermal conversion applications

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Microemulsion-mediated method is one of the unique and ideal techniques for the preparation of nanoparticles. A one-pot microemulsion method was introduced in this research to synthesize and disperse iron oxide ($Fe_3O_4$) in an ionic base fluid of lithium bromide-water. An effective steric repulsion force was provided by the surface functionalization of nanoparticles during the phase transfer. The functionalization stage was performed by formation of a bi-ligand surfactant around nanoparticles during the phase transfer of particles from oil phase to water phase. The formed nanoparticles exhibited a superior stability against agglomeration in the presence of high concentrations of lithium bromide, i.e. 50 wt%, which make them good candidates for a range of novel applications. The nanoparticles were analyzed by zeta potentiometer, Lumisizer dispersion analyzer, UV-visible spectroscopy, dynamic light scattering (DLS) and transmission electron microscopy (TEM). As the reactants concentration and temperature is elevated, the crystalline structure completion increase gradually, and the morphology of nanoparticles changes from a spherical into a rod-like shape. The photo-thermal conversion characteristics of spherical and rod-shape nanoparticles also was studied under a solar simulator. Experimental analysis indicates that the benefit of adding iron oxide nanoparticles into fluid was not only increasing photon trapping efficiency to increase the bulk temperature under solar radiation, but also more likely to increase evaporation rate due to surface localized heat generation. According to the results, the suitable photo-thermal conversion of nanoparticles together with high stability in ionic media, nominates the iron oxide nanoparticles as a good candidate for using in solar air conditioners.

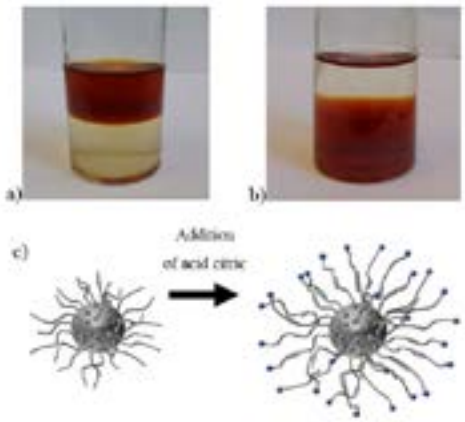


**Figure 1:** (a, b) phase transformation of iron oxide nanoparticle from organic phase to aqueous phase, and (c) the proposed mechanism for formation ne w ligand around particles during phase transformation.

## Biography

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