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PREPERATION OF SURFACTANT FREE MICROEMULSIONS USING MgO NANOPARTICLES

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A microemulsion is a homogeneous mixture containing water, oil and emulsifier, which is a transparent, optically isotropic and thermodynamically stable liquid. Conventional microemulsions are stabilized by surfactants, amphiphilic organic compounds such as Span® 80 or Tween® 80. However, emulsions can be stabilized by fine solid particles without surfactants and they are called Pickering emulsions. Properties of Pickering emulsions can be altered by introducing various types of solid particles bearing magnetic, UV absorbent, conductive, anti-microbial properties and different sizes of solid particles in the range of nanometer to micrometer. Hence, they can be applied in drug delivery systems, pharmo-cosmetic industry and many other areas.

The stability of the Pickering emulsions depends on surface charges of the solid particles as well as the contact angles of two liquids on the particle. The aim of the present study was to investigate the effect of MgO nanoparticles on the preparation of Pickering emulsions.

The study was carried out using olive oil, water and MgO nanoparticle system. MgO nanoparticles were synthesized by ultra-sonication assisted sol-gel method and characterization accomplished by Scanning Electron Microscopy (SEM) and powder XRD method. MgO nanoparticles were dispersed in deionized water by ultra-sonication and emulsification was done by homogenization at different temperatures with Olive oil. In contrast to conventional microemulsions, which need large amount of surfactants, these Pickering emulsions need only a very small amount of nanoparticles. The optimum amount of MgO nanoparticles required to stabilize 12 cm^3 of emulsion was 10 mg. The emulsion formation is initiated at 6:4 volume ratio of water: olive oil. Moreover, emulsification was observed by further increasing volume of water and proportionally changing the volume of olive oil. They were used for further characterization of the Pickering emulsions.

It was found that the optimum emulsification temperature is 70 °C. Therefore, prepared MgO based micro-Pickering emulsions are transparent and stable not only thermodynamically, but also kinetically. The droplet size of Pickering emulsions depends on the particle size of the solid. Since the nano scale MgO particles were used, the droplet size is also in nano scale. Therefore, the droplets of the emulsion were not visible through the optical microscopy.