

PREPARATION OF SURFACTANT FREE MICROEMULSIONS USING MgO NANOPARTICLES

B. P. Sisiranandana

Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

Department of Chemistry, University of Peradeniya

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 which are 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, cosmetics and many other areas. The stability of the Pickering emulsions depends on surface charges of the solid particles as well as the contact angle of two liquids make with the solid 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 the powder XRD method and SEM. Emulsification was done by ultra-sonication followed by homogenization at different temperatures. In contrast to conventional microemulsions, which needs large amounts of surfactants, these Pickering emulsions need only a very small amount of nanoparticles. The optimum amount of MgO nanoparticles required to stabilize 12 cm³ 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 increased volume of water and proportionally changing the volume of Olive oil. They were used for further characterization of the Pickering emulsions. Further, it was found that the optimum emulsification temperature is 70 °C. The prepared MgO based micro-Pickering emulsions are transparent and stable for more than 6 months. From microscopic analysis and particle size measurements it could be concluded that the droplet size is in nanometer scale. The drug loading capacity of MgO based micro – Pickering emulsions was investigated by introducing a model drug, nicotinamide, commonly known as Vitamin B3 to the emulsion system. The maximum drug loading capacity of the prepared emulsion measured using UV – Visible spectrophotometry was found to be $15.69 \pm 1.35 \text{ mg / cm}^3$ ($1.66 \pm 0.14 \text{ % W / W}$). This suggests potential applications of nicotinamide which has high UV absorbance in UV screening micro – Pickering emulsions.