

Encapsulation of Pharmaceutical Oils in Wormlike Micelles

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Abstract

Above the critical micelle concentration, surfactant molecules self-associate into micelles of different shapes and sizes. Under specific conditions, micelles can grow into elongated 'polymer-like' flexible aggregates, known as wormlike micelles, which display remarkable viscoelastic properties. Despite their widespread uses in a range of industrial and technological applications, very few studies have been reported on their use in the pharmaceutical field. This work aims at exploiting novel formulations of wormlike micelles from biocompatible and biodegradable non-ionic surfactants as topical drug delivery vehicles.

The surfactant, polyoxyethylene cholesteryl ether, was used in combination with a range of non-ionic surfactants, including glycerol- and polyoxyethylene- based surfactants. Rheological measurements in combination with small-angle neutron scattering experiments confirmed the growth of the micelles into wormlike micelles. A range of pharmaceutical oils were successfully encapsulated in the micelles, including aliphatic oils, aromatic oils and terpenes. The presence of the oil significantly affected the phase behaviour and the variations are to be attributed to the different packing of the oils into the supramolecular structures. Cryo-TEM pictures confirmed the formation of wormlike micelles and other interesting micellar structures upon addition of co-surfactants and/or oil.