Nano structured microemulsion and co-crystallization of lactic acid and salicylic acid as topical drug

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Abstract

This study aims to prepare topical salicylic acid and lactic acid microemulsion with a different formulation applied using the minimum amount of Tweens. The sugar surfactant used in this study is sorbitan monooleate (Tween 80). Short chain alcohol used as a co-surfactant which is propylene glycol. The oil phase used is castor oil. The aqueous phase is purified water. Also this study aims to prepare a co-crystal paradigm between salicylic acid and lactic acid as the active pharmaceutical ingredients, in presence of using different co-solvents.

In this research, we studied the effect of different percentage of surfactants on the phase behavior of the systems suggested at different temperatures 25, 37 and 45°C. We also explored the effect of adding co-surfactant (propylene glycol) on the phase behavior. The addition of propylene glycol as a co-surfactant contributes clearly in forming much smallest and stable micro emulsion droplet size besides giving pliability to the infected skin. Lastly the phase behavior of sorbitan monooleate was studied as a function of temperature and surfactant concentration; that is presented in the form of the well known phase diagram that shows an isotropy microemulsion solution (using visual inspection, cross polarizer and dynamic light scattering) as low as 4% water addition at all temperatures (25˚C, 37˚C and 45˚C).

Also in this research, we studied the ability of different co-solvents used in the formation of co-crystal paradigms, such as ethanol (96%), methanol (99%), diethyl ether and acetonitrile either in reflux or grinding techniques. The co-crystal paradigm was obtained in all reflux techniques applied successfully; more than 80% from the grinding technique of the samples obtained creates a merged compound successfully. All paradigms are tested using Fourier Transform Infra-Red spectroscopy (FTIR) and the melting point range is tested for part of them. The co-crystals obtained were tested for solubility modifications and the results show a clear change in their solubility to be sparingly soluble to soluble in water. Also the co-crystal solids were tested for their melting point and the variation change observed is dependent on the target active pharmaceutical concentration and depending on the molar ratio for each co-crystal tested. But even so the melting point was changed to be lower than pure salicylic acid melting point and higher than lactic acid.