

Green Solvents and Solutions

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Mixing hydrophilic and hydrophobic substances is in the center of formulation technology. Commonly, surfactants are used to dissolve oily substances in water. Then, micellisation or liquid crystalline formation is the main mechanism for dissolution. However, oil and water can be made compatible also by so-called hydrotropes, viz. amphiphilic molecules that do not form defined structures [1]. Remarkably, even small hydrotropic molecules such as ethanol can form so-called surfactant-free microemulsions when mixed with water and oil [2,3,4]. When appropriate salts are added, the combination of hydrotropes and salt leads to structures very similar to those of conventional microemulsions.

In an attempt to formulate greener products it is certainly desirable to avoid surfactants. If this is not possible, the surfactants should be as green as possible. It will be shown how soaps can be used with appropriate green counter-ions [5] and green additives to make new formulations without soap precipitation and at neutral pH. It will also be shown how green microemulsions can be made that, in addition, are fully water dilutable [6].

Of course, the solvents should also be as green as possible. In this context Ionic Liquids [7-9] and, more recently, so-called Deep Eutectic Solvents [10] are discussed. A short critical review will be given on these substance classes, especially with respect to their applicability in formulations and to their "green" (or not-green) properties. Some potential applications of both classes will be also given.

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