

# Deep Eutectic Solvents for the efficient separation of lipases from aqueous solutions

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## **ABSTRACT**

The emergence of Deep Eutectic Solvents (DES) has opened up new opportunities for attaining greener processes in areas like biotechnology or chemistry. In this sense, since the first eutectic mixture was reported by Abbot [1], choline chloride has been widely employed as model hydrogen bond acceptor (HBA) combined with different compounds acting as hydrogen bond donor (HBD). The suitable biocompatibility of choline with enzymes has prompted their application in biocatalysis as replacements of conventional solvents, specially when water cannot be present in the system [2]. More specifically, their application in separation processes like aqueous biphasic systems (ABS) is appealing to ease the extraction of enzymes. Actually, after Rogers and collaborators [3] reported the ability of neoteric solvents to be salted out in aqueous solutions by high charge density inorganic salts, the application of DES in this kind of separation processes has bloomed.

In view of the above, it has been demonstrated by our group the ability of different DES to salt out aqueous solutions of non-ionic surfactants (e.g. Triton and Tween families). In this work we have characterized the binodal curves by the cloud point method, and we have subsequently determined the tie-lines. All the data were discussed in the light of the hydrophobicity of the surfactant and the salting-out potential of the DES under study. Afterwards, the effect of the ABS components on the lipolytic activity of a model lipase was analysed and its extraction from aqueous solutions was approached. Very high levels of enzyme separation were obtained, thus demonstrating the biocompatibility of these neoteric solvents with lipolytic enzymes.

**Keywords:** Non-ionic surfactants, ionic liquids, biotechnology, pollutants

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