

Lipolytic enzyme extraction using polymeric surfactants and ionic liquids

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ABSTRACT

During the last years, the successful use of polymeric surfactants as enzyme inducers in biotechnological applications has been demonstrated [1]. The development of novel Aqueous Biphasic Systems (ABS) by means of neoteric solvents is a topic in the limelight. Ionic liquids are salts that are liquid at temperatures below 100°C, and they entail advantages regarding conventional organic solvents like their null flammability, negligible volatility, thermal stability and tunability [2]. The latter has prompted the scientific community to invest increased research efforts to investigate the role of cations and anions in the chemical and physical properties of each specific ionic liquid. In this sense, although imidazolium families are, by far, the most commonly employed ionic liquids (produced at ton quantities per annum) [3], during recent years the bet in more biocompatible cations like cholinium is attracting more interest. These salts have been applied in different extraction systems and their ability to trigger phase disengagement in aqueous solutions of surface active compounds has been thoroughly addressed by our research group.

Then, the role of different inorganic and organic salts and ionic liquids in aqueous solutions of non-ionic surfactants belonging to Triton and Tween families has been investigated. These surfactants have been commonly employed in upstream and downstream operations of an array of biotechnological processes, and their biodegradability has been demonstrated. Therefore, the binodal curves in these aqueous biphasic systems were experimentally obtained. The solubility curves and tie-lines were modelled with empirical equations like Merchuk or Othmer-Tobías, respectively. This work made up the basis for the successful application of these systems for the extraction of lipolytic enzymes from culture broths, going from processes tackling mesophiles to extremophilic microorganisms. All in all, the present research work demonstrates the importance of new families of ionic liquids based on cholinium cation and aminoacid anions to be applied as biomolecules extractants.

Keywords: Non-ionic surfactants, ionic liquids, lipases, extraction

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Acknowledgements: The authors thank Xunta de Galicia and ERDF for funding through a postdoctoral grant (ED481D-2019/017). The authors are grateful to the Spanish Ministry of Science, Innovation and Universities for the financial support through the project RTI2018-094702-B-I00.