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Double-reversible aqueous biphasic systems formed by ionic liquids and polymers

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PURPOSE OF THE ABSTRACT

Aqueous biphasic systems (ABS) are an alternative to conventional liquid-liquid extractions, which use volatile organic compounds [1]. ABS are formed by a combination of two non-volatile compounds, such as two polymers, a polymer and a salt or two salts, with the majority of the composition being water. More recently, it was shown that the introduction of ionic liquids (ILs) in ABS enabled to overcome the polarity limitation of conventional ABS composed of polymers [2]. In this work, the goal is the development of IL-based ABS simultaneously responsive to pH and temperature to be used as separation platforms. Cholinium-based ILs comprising anions derived from carboxylic acids were synthetized and studied in the formation of ABS with polypropylene glycol with a molecular weight of 400 g.mol-1 (PPG 400). The respective ternary liquid liquid-liquid phase diagrams were determined at three temperatures (25°, 35° and 45° C) and in a pH range from 3 to 7. Based on the results obtained, it is demonstrated that the developed ABS are responsive to both temperature and pH, being thus double-reversible liquid-liquid systems. It was found that the increase of the temperature favors the formation of two phases, following a lower critical solution behavior (LCST). On the other hand, the increase of pH favors the formation of ABS. Therefore, ABS composed of cholinium-based ILs and PPG can be designed as double-switchable platforms for the separation and purification of (bio)molecules.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Aqueous biphasic systems | Ionic liquids | Reversible systems

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