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Editors: Prof. Dr. Slobodan Gadžurić
Prof. Dr. Marija Bešter-Rogač
Prof. Dr. Sanja Belić

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P20

Partitioning of L-tryptophan and vanillin in aqueous biphasic systems containing novel polymerized ionic liquids

Petr Korchak, Evgenia Safonova and Alexey Victorov

Department of Physical Chemistry, Saint Petersburg State University, Saint Petersburg, 198504, Russia

Presenting author email: p.korchak@spbu.ru

Aqueous biphasic systems (ABSs) based on ionic liquid (IL) and kosmotropic salt are considered as promising for the liquid-liquid extraction of biomolecules [1]. By chemical modification of ILs' ions it is possible to influence intermolecular interactions and, as a result, obtain ABSs with the required properties. For instance, ILs with amino acid anions attract special attention because of their low toxicity [2] and likely biocompatibility. Another example of modified ILs is polymerized ILs (PILs), which have recently been considered as new promising candidates for the enhanced bioextraction [3].

The aim of this work is to investigate the effect of chemical structure of PILs on liquid-liquid equilibrium (LLE) in ABSs (PIL- K_3PO_4 - H_2O) and on the partitioning of model solutes (L-tryptophan, vanillin) between liquid phases. Our studies include poly-(diallyldimethylammonium) chloride (poly-[DADMA]Cl) and amino acid PILs based on poly-(diallyldimethylammonium) cation (poly-[DADMA]X, where X = [Leu] – L-Leucinate, [Val] – L-Valinate, [Lys] – L-Lysinate) that have been synthesized for the first time.

In the selected ABSs, we obtained data on LLE and on the partition coefficients of L-tryptophan and vanillin (Figure 1). The partition coefficients in ABSs with amino acid PILs are higher than in the systems with poly-[DADMA]Cl. Similar partitioning of L-tryptophan was observed in ABSs based on 1-butyl-3-methylimidazolium ILs [4]. We found specific interactions (hydrogen-bonding) between vanillin and amino acid anions, which explain the high extractive capacity observed for ABSs with amino acid PILs.

We conclude that ABSs with amino acid PILs are promising for the extraction of small hydrophobic biomolecules. Our results help in understanding the driving forces of phase separation and partitioning of the solutes and may be of use in developing methods of extraction that belong to the field of "green chemistry".

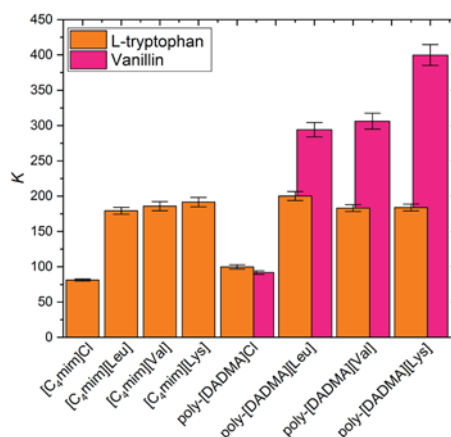


Figure 1. Partition coefficients (K) of L-tryptophan and vanillin in ABSs based on PILs at 298.15 K and in the systems based on 1-butyl-3-methylimidazolium ILs [4].

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