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Effect of sugar additive on partition behavior of bioorganic compounds in aqueous biphasic systems containing nonionic surfactant Triton X-114

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Nonionic ethoxylated surfactants are surface-active compounds that tend to become insoluble in water when heated above the certain temperature called cloud point temperature (CPT). These particular characteristics of nonionic surfactants, their biocompatibility and low toxicity gave rise to many applications, specifically to extraction processes (cloud point extraction, CPE). One of the widely used extracting agents is (1,1,3,3-tetramethylbutyl)phenyl-polyethylene glycol (Triton X-114) due to its low CPT.

It is well known that different additives (salt, sugar etc.) or pH value may affect CPTs and the thermophysical characteristics (density, viscosity) of nonionic surfactant systems [1]. This has a particular meaning for enzymatic reactions as highly sensitive to temperature or pH changes.

In the present work, the aqueous biphasic systems containing Triton X-114, L-arabinose and salt buffer (KH_2PO_4/K_2HPO_4) are considered as reaction medium for enzymatic hydrolysis of penicillin G (Pen G) to phenylacetic acid (PAA) and 6-aminopenicillanic acid (APA). The chemical equilibrium of this bioreaction is shifted to the products in case of effective extraction of PAA into surfactant-rich phase [2]. CPTs and the partition coefficients Pmw of solutes (Pen G, PAA, APA) are under investigation. The data on Pmw were obtained at 310,2 K and pH=4,3 providing the highest velocity of the bioreaction.

The results show that CPTs decrease at increasing concentration of L-arabinose. PAA also causes significant reduction of CPT while APA has a negligible effect on it. The data on partition coefficients show that L-arabinose as additive improve extraction of PAA to the surfactant-rich phase.

References
1. E. Ritter, R. Racheva, S. Jakobtorweihen, I. Smirnova // *Chem. Eng. Res. Des.* **121,** 149–162 (2017)
2. Z. Wang, L. Wang, J-H. Xu, D. Bao, H. Qi // *Enzyme Microb. Technol.* **41,** 121–126 (2007)