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Title: Effect of NaCl additive on solute-solvent interactions in aqueous polyethylene glycol-sodium sulfate two-phase systems

Author: Nuno R. da Silva Luisa A. Ferreira Pedro P. Madeira José A. Teixeira Vladimir N. Uversky Boris Y. Zaslavsky



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1 Effect of NaCl additive on solute-solvent interactions in aqueous polyethylene glycol-sodium
2 sulfate two-phase systems

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4 Nuno R. da Silva^a, Luisa A. Ferreira^b, Pedro P. Madeira^c, José A. Teixeira^a, Vladimir N.
5 Uversky^d, Boris Y. Zaslavsky^{b*} bz@analiza.com

6
7 ^aCEB - Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal

8 ^bAnaliza, Inc., 3615 Superior Ave., Cleveland, OH 44114, USA

9 ^cLaboratory of Separation and Reaction Engineering, Department of Chemical Engineering,
10 Faculty of Engineering of the University of Porto, Rua Dr. Roberto Frias, 4200-465, Porto,
11 Portugal;

12 ^dDepartment of Molecular Medicine, Morsani College of Medicine, University of South Florida,
13 Tampa, Florida 33612, USA

14 Highlights

15 Solvent properties of aqueous poly(ethylene glycol)-8000-sodium sulfate aqueous two-phase
16 systems containing 0.215 M NaCl and 0.5 M osmolyte (sorbitol, sucrose, trimethylamine N-
17 oxide) and poly(ethylene glycol)-10000-sodium sulfate aqueous two-phase system containing
18 0.215 M NaCl are characterized

19 Partitioning of eight organic compounds and six proteins in the systems are examined

20 Partition behavior of all solutes is considered in terms of solute-solvent interactions

21 It is established that NaCl additive interacts with the solutes in the presence of exceeding amount
22 of sodium sulfate

23 Abstract

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27 Partition behavior of eight small organic compounds and six proteins was examined in
28 poly(ethylene glycol)-8000-sodium sulfate aqueous two-phase systems containing 0.215 M NaCl
29 and 0.5 M osmolyte (sorbitol, sucrose, TMAO) and poly(ethylene glycol)-10000-sodium sulfate-
30 0.215 M NaCl system, all in 0.01M sodium phosphate buffer, pH 6.8. The differences between
31 the solvent properties of the coexisting phases (solvent dipolarity/polarizability, hydrogen bond
32 donor acidity, and hydrogen bond acceptor basicity) were characterized with solvatochromic
33 dyes using the solvatochromic comparison method. Differences between the electrostatic
34 properties of the phases were determined by analysis of partitioning of sodium salts of
35 dinitrophenylated (DNP-) amino acids with aliphatic alkyl side-chain. The partition coefficients
36 of all compounds examined (including proteins) were described in terms of solute-solvent
37 interactions. The results obtained in the study show that solute-solvent interactions of nonionic
38 organic compounds and proteins in polyethylene glycol-sodium sulfate aqueous two-phase
39 system change in the presence of NaCl additive.

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41 **Keywords:** Aqueous two-phase system; partitioning; proteins, solute-water interactions;
42 solvatochromic comparison method; solvent properties

43 1. Introduction

44 Aqueous two-phase systems (ATPSs) formed in aqueous mixtures of a single polymer and
45 specific salt, such as polyethylene glycol (PEG) and sodium sulfate, phosphate or citrate, are
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