Interfacial partitioning behaviour of bovine serum albumin in polymer-salt aqueous two-phase system

ABSTRACT

A relationship is proposed for the interfacial partitioning of protein in poly (ethylene glycol) (PEG)-phosphate aqueous two-phase system (ATPS). The relationship relates the natural logarithm of interfacial partition coefficient, ln G to the PEG concentration difference between the top and bottom phases, Δ[PEG], with the equation $\ln G = A\Delta[PEG] + B$. Results showed that this relationship provides good fits to the partition of bovine serum albumin (BSA) in ATPS which is comprised of phosphate and PEG of four different molecular weight 1450 g/mol, 2000 g/mol, 3350 g/mol and 4000 g/mol, with the tie-line length (TLL) in the range of 44–60% (w/w) at pH 7.0. The decrease of A values with the increase of PEG molecular weight indicates that the correlation between ln G and Δ[PEG] decreases with the increase in PEG molecular weight and the presence of protein–polymer hydrophobic interaction. When temperature was increased, a non-linear relationship of ln G inversely proportional to temperature was observed. The amount of proteins adsorbed at the interface increased proportionally with the amount of BSA loaded whereas the partition coefficient, K remained relatively constant. The relationship proposed could be applied to elucidate interfacial partitioning behaviour of other biomolecules in polymer-salt ATPS.

Keyword: Aqueous two-phase system; Interfacial partition; Statistical mechanics; Bioseparation; Protein recovery; Purification.