SURFACTANT ION-PAIR HPLC - A GROUP CONTRIBUTION APPROACH

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The past nine years has seen the dramatic increase in the use of high pressure liquid chromatography (hplc) as an analytical tool for the analysis of solutes. Many compounds of pharmaceutical interest (e.g. drugs, metabolites, phytochemicals etc.) are either polar species or able to be ionised. Use of this fact has permitted the analysis of such solutes by ion-pair hplc methods (Eksborg and Schill, 1973). Such techniques involve the addition of an oppositely charged pairing ion to the chromatographic phase system, so that ion-pair formation occurs between the solute and pairing ion and affects retention by various mechanisms. Reversed phase ion-pair hplc (where the pairing ion is added to the mobile phase) has been shown to have high flexibility for controlling retention, and to be at least as efficient as conventional reversed phase techniques, particularly when the pairing ion is a surfactant (Wittmer, Nuessle and Haney, 1975; Knox and Jurand, 1976).

There is a need to be able both to predict retention behaviour in such systems and to rationalise the types of phase systems to be employed for any one solute. Previously an extrathermodynamic group contribution approach has been used for predicting unionised solute retention in reverse phase systems (Tomlinson, Poppe and Kraak, 1976). In this communication a similar approach is reported for the analysis of various solutes in reverse phase systems using surface active agents as added pairing ions.

Both anionic and cationic solutes and pairing ions have been investigated. The effect on the retention of a series of substituted benzoic acids following the addition of different homologues of alkylbenzyldimethylammonium chlorides (ABDACs) to a mobile phase of aqueous methanol (1:1), has been studied. Similarly, the effect of adding alkylsulphates to the mobile phase on the retention of cationic solutes such as substituted aza-purin-6-ones, substituted 1,3,5-triazines and tryptophan metabolites has been investigated.

Log r_{ji} values of the benzoic acid substituents were determined in different mobile phase systems, as was the methylene group contribution of the ABDACs. These investigations and the attempted correlations of log r_{ji} with π and σ showed that retention in surfactant ion-pair hplc is not due to a simple ion-pair partitioning and that a mixed system of retention is occurring.

The usefulness of a group contribution approach has been demonstrated for the assay of tryptophan in biological fluids, and in the separation of tryptophan from its metabolites. The possibility of using surfactant ion-pair HPLC for generating hydrophobicity parameters for use in quantitative drug design models has also been studied by the correlation of log r_{ji} and log MIC for a series of substituted 1,3,5-triazines, and substituted aza-purin-6-ones.

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