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Theoretical aspects of micellar liquid chromatography using C_{12}DAPS surfactant

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Abstract

Theoretical aspects of micellar liquid chromatography using a zwitterionic surfactant were investigated. The micellar mobile phase consisted of *n*-dodecyl-*N*,*N*-Dimethylamino-3-propane-1-sulfonate (better known as C_{12}DAPS) aqueous solutions. Chromatography was carried out on μ Bondapak C_{18} column, UV detection was measured at 254 nm. Using the Armstrong equation, the partition equilibria constants of the solutes chromatographied were established between water and stationary phase; water and micelles; micelles and stationary phase. Compared to anionic or cationic surfactants, the zwitterionic surfactant gives the highest K_{SW} values and a lowest K_{MW} values. Therefore, for a constant surfactant concentration, capacity factors are greater on C_{12}DAPS. Hydrophobic interactions with the stationary phase, electrostatic effects of the surfactant from both the micelle and the surfactant modified stationary phase explain the retention of a solute. An other way to study molecular interactions is made via the linear solvation energy relationships (LSER). For the test solutes used, it seems that $V_1/100$ (solute's size) and β (basicity) are predominant to affect the retention. K_{SW} LSER correlation express the binding of the solute with the micelles. The term s found is positive. C_{12}DAPS has a greater dipolar environment affecting considerably the MLC partition. The term a is positive, acidic solutes binds more easily with the zwitterionic surfactant than with SDS.

Keywords: Micellar liquid chromatography; C_{12}DAPS; Capacity factor; Thermodynamic of the retention; LSER model

1. Introduction

Since the first report of Armstrong and Nome [1], micellar liquid chromatography (MLC) had a solid growth. The potential applications and unique capabilities of MLC have been investigated in more than one hundred papers including several reviews [2–4]. Most of the micellar mobile phases include anionic surfactant (sodium dodecyl sulfate), cationic surfactant (hexadecyltrimetyl or dode-

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