

Use of cyclodextrin mobile phases in thin-layer chromatography of fluoresceins

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Keywords: thin-layer chromatography, fluoresceins, cyclodextrins.

Abstract

The reagents of the xanthene series (fluorescein, dibromofluorescein, tetrabromofluorescein, tetraiodofluorescein, and Bengal pink) are widely used in various industries. At present, modern analytical techniques are used to analyze fluoresceins in industrial and natural objects. However, most of them are quite expensive and require considerable time. Thin-layer chromatography (TLC), characterized by simplicity, availability of analysis, separation efficiency and cheapness, has gained much less use. In this regard, the purpose of this work was to reveal features of the chromatographic separation and analysis of the xanthene series reagents by TLC in aqueous and cyclodextrin-modified mobile phases.

Standard fluorescein solutions with a concentration of $1.0 \cdot 10^{-3}$ M were prepared by dissolving exactly weighed samples in ethanol. Their chromatography was carried out by ascending thin-layer chromatography on plates of various polarities (Sorbfil, Polyamide-6, Plasmachrom, and RP-18) with a fixed sorbent layer. Aqueous solutions of cyclodextrins (β -cyclodextrin (β -CD), 2-hydroxypropyl- β -cyclodextrin (2-HP- β -CD), hydroxypropyl- γ -cyclodextrin (HP- γ -CD)), with and without organic solvents (ethanol, propanol-2, and acetonitrile) and strong electrolytes added (potassium chloride, sodium chloride, lithium chloride, sodium sulfate, sodium nitrate, and sodium bromide) were used as mobile phases. Chromatographic zones were identified on a Sorbfil video-densitometer (Sorbopolymer, Krasnodar, Russian Federation) with a UV lamp (TUV PL-S PHILIPS, 254 and 365 nm) without any chemical processing of chromatograms.

It has been established that, irrespective of the stationary phase nature, the R_f values of the reactants increase with increasing CD concentration in the mobile phase. More hydrophobic reagents are more strongly retained by the stationary phase. The efficiency and selectivity of separation in CD-containing MPs depends on the CD cavity size and the presence of substituents in its molecule. The combined presence of CD and electrolyte in MP improves the compactness and clarity of chromatographic zones.

The revealed features of the separation and analysis of the xanthene series reagents in cyclodextrin mobile phases can be used to separate mixtures of fluorescein derivatives and to evaluate the purity of commercial preparations.

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