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Polarity tuned perphenylcarbamoylated cyclodextrin separation materials for achiral and chiral differentiation

Xiaoxuan Li[1,2], Jia Li[1,2], Qing Kang[1,2*], Yong Wang[1,2*]

[1]Tianjin Key Laboratory of Molecular Optoelectronic Science, Department of Chemistry, School of Science, Tianjin University, Tianjin, China

[2]Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300072, China

[*]Corresponding. Tel./fax: +86 22 27403475. wangyongtju@tju.edu.cn

Abstract

Phenylcarbamoyls are known to remarkably accentuate cyclodextrin's enantioselectivities. In this work, by inducing electron-donating methoxyl or electron-withdrawing bromine/trifluoromethyl moieties, three novel cyclodextrin enantioseparation materials including per(4-trifluoromethoxy) phenylcarbamoylated-β-CD CSP (CSP1), per(4-bromo)phenylcarbamoylated-β-CD CSP (CSP2) and per(4-methoxy)phenylcarbamoylated-β-CD CSP (CSP3) were prepared via thiol-ene click chemistry. The polarity tuning decorations are found to significantly influence the CSPs' achiral and chiral separation performance. The three CSPs can easily separate toluene, 1,2-xylene and 1,3,5-trimethylbenzene with the strongest retention on CSP3. In reversed-phase mode, the three CSPs exhibited completely different enantioseparation ability towards specific isoxazolines and flavonoids. 4'-hydroxyflavanone was separated on CSP1 with a resolution of 9.24 while 6-methoxyflavanone was best separated on CSP2 (R_s = 9.98). CSP3 exhibited the strongest differentiation ability towards 4NPh-2Py (R_s = 9.69). The comparison study may provide some insight into the design of functional cyclodextrin materials.

Key words: Enantioseparation; phenylcarbamoyl; chiral separation phases; achiral separation

Introduction

Separation of isomeric pharmaceutical drugs with different pharmacological and therapeutic property into optical pure isomers has been one of the most important issues [1-4]. High-performance liquid chromatography (HPLC) is one of the most powerful approaches for enantioseparation. Cyclodxtrins (CDs) are cyclic oligosaccharide molecules with the properties of chiral recognition and complex formation [5-9]. Therefore, CDs and their derivatives are widely used as chiral