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The performance of four commercially available cellulose tris(3,5-dimethylphenylcarbamate) based chiral stationary phases (CSPs) was evaluated with parallel high performance liquid chromatography (HPLC) and super critical fluid chromatography (SFC). Retention, enantioselectivity, resolution and efficiency were compared for a set of neutral, basic and acidic compounds having different physico-chemical properties by using different mobile phase conditions. Although the chiral selector is the same in all the four CSPs, a large difference in the ability to retain and resolve enantiomers was observed under the same chromatographic conditions. We believe that this is mainly due to differences in the silica matrix and immobilisation techniques used by the different vendors.An extended study of metoprolol and structure analogues gave a deeper understanding of the accessibility of the chiral discriminating interactions and its impact on the resolution of the racemic compounds on the four CSPs studied. Also, a clear difference in enantioselectivity is observed between SFC and LC mode, hydrogen bonding was found to play an important role in the differential binding of the enantiomers to the CSPs.

Highlights

 Chiralcel OD-H and Kromasil CelluCoat showed great similarities. Better mass transfer kinetics for IB in SFC mode compared to OD. Bidentate complexes with the CSP through H-bonding give rising enantioselectivity Hydrogen bonding was more important in SFC for resolution to occur. Chiral discrimination in LC and SFC occurs by somewhat different mechanisms.

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