

## Evaluation of triproline and tri- $\alpha$ -methylproline chiral stationary phases retention and enantioseparation associated with hydrogen bonding

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### ABSTRACT

In this study, to demonstrate preparation strategy and improve understanding of chiral recognition mechanisms, triproline chiral stationary phases (CSPs) were evaluated with a series of analytes classified as having none, one, two or three H-bond donors. The average retention factors and mobile phase strength generally followed none < one < two < three hydrogen bond donors. The average solvent volume ratio ( $H_r$  stands for average hexane volume ratio in the mobile phase,  $H_{p_r}$  for heptane,  $ACN_r$  for acetonitrile, or  $H_2O_r$  for water) normalized chromatographic parameters calculated for di-, tri-, tetra-, penta-, hexa-, and decaproline CSPs facilitated the characterization of properties associated to the H-bond donor categorization. The  $H_r$  of triproline CSP were 1.0, 0.96 and 0.88 for analyte of none, one and two hydrogen bond donors with hexane/2-propanol mobile phase, respectively. The number of hydrogen bond donors in an analyte was found to be a primary factor in influencing the retention and enantioseparation in the normal phase and polar organic modes. Two H-bond acceptor solvents methyl *tert*-butyl ether and ethyl acetate increased chiral separation on oligoproline CSPs for some compounds. The role of carbon-donor hydrogen bonding at the H atom of proline asymmetric center was implied through testing a tri- $\alpha$ -methylproline stationary phase. On oligoproline CSPs, three factors including adjacent hydrogen bond acceptor and carbon-donor, and a rigid proline residue chain were recognized as important for contributing to the broad enantioselectivity. The  $\alpha$  hydrogen atom on chiral center of stationary phase was found to play a crucial role in enantiomeric discrimination.

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