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Influence of silica functionalization by amino acids and peptides on the stationary phases zeta potential

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Highlights

- The different type and chain lengths of amino acids and peptides were studied.
- The incorporation of amino acids and peptides intensifies positive zeta potential.
- The more hydrophilic ligand properties the higher zeta potential was observed.
- The zeta potential shifted from positive to negative values with pH increase.
- The correlation between solvation processes and the zeta potential was found.

Abstract

In this study, the zeta potentials of silica-based stationary phases with chemically bonded amino acids and peptides of different types (glycine, alanine, phenylalanine, leucine, and aspartic acid) and chain lengths (amino acid, di- and tripeptides) have been measured in water/acetonitrile and water/methanol solutions. The zeta potential changes with ionic strength of the mobile phase were tested using phosphate buffer. A series of home-made stationary phases were also studied in different pH conditions. In order to compare how the modifications based on the amino acids vary from the conventional packings, pure silica, silica modified with aminopropyl ligands, and octadecyl groups were also studied. The results show that the increase of the amino acid polarity and sequence length causes higher zeta potential values. The changing conditions from acidic to basic result in shifting the zeta potential values from positive to negative. Depending on the environment, different ionization states of the chemically bonded functionalities provide different charge distribution on the surface of the particles.

Keywords: Amino acids; peptides; stationary phases; zeta potential; surface characterization