

## Selective Separation of Amino Acids by Reactive Extraction with Di-(2-Ethylhexyl) Phosphoric Acid

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**Abstract :** Amino acids are valuable chemical products used in human foods, in animal feed additives and in the pharmaceutical field. Recently, there has been a noticeable rise of amino acids utilization throughout the world to include their use as raw materials in the production of various industrial chemicals: oil gelating agents (amino acid-based surfactants) to recover effluent oil in seas and rivers and poly(amino acids), which are attracting attention for biodegradable plastics manufacture. The amino acids can be obtained by biosynthesis or from protein hydrolysis, but their separation from the obtained mixtures can be challenging. In the last decades there has been a continuous interest in developing processes that will improve the selectivity and yield of downstream processing steps. The liquid-liquid extraction of amino acids (dissociated at any pH-value of the aqueous solutions) is possible only by using the reactive extraction technique, mainly with extractants of organophosphoric acid derivatives, high molecular weight amines and crown-ethers. The purpose of this study was to analyse the separation of nine amino acids of acidic character (l-aspartic acid, l-glutamic acid), basic character (l-histidine, l-lysine, l-arginine) and neutral character (l-glycine, l-tryptophan, l-cysteine, l-alanine) by reactive extraction with di-(2-ethylhexyl)phosphoric acid (D2EHPA) dissolved in butyl acetate. The results showed that the separation yield is controlled by the pH value of the aqueous phase: the reactive extraction of amino acids with D2EHPA is possible only if the amino acids exist in aqueous solution in their cationic forms (pH of aqueous phase below the isoelectric point). The studies for individual amino acids indicated the possibility of selectively separate different groups of amino acids with similar acidic properties as a function of aqueous solution pH-value: the maximum yields are reached for a pH domain of 2-3, then strongly decreasing with the pH increase. Thus, for acidic and neutral amino acids, the extraction becomes impossible at the isoelectric point (pHi) and for basic amino acids at a pH value lower than pHi, as a result of the carboxylic group dissociation. From the results obtained for the separation from the mixture of the nine amino acids, at different pH, it can be observed that all amino acids are extracted with different yields, for a pH domain of 1.5-3. Over this interval, the extract contains only the amino acids with neutral and basic character. For pH 5-6, only the neutral amino acids are extracted and for pH > 6 the extraction becomes impossible. Using this technique, the total separation of the following amino acids groups has been performed: neutral amino acids at pH 5-5.5, basic amino acids and l-cysteine at pH 4-4.5, l-histidine at pH 3-3.5 and acidic amino acids at pH 2-2.5.

**Keywords :** amino acids, di-(2-ethylhexyl) phosphoric acid, reactive extraction, selective extraction

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