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Development of a new humic acid based- stationary phases for separation and identification of different types of pharmaceuticals using central components analysis

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S**tatement of the Problem:** High performance liquid chromatography (HPLC, including UHPLC) is one of the most powerful separation techniques capable of providing analysis difficult or impossible with other separation approaches. Thus, chromatographers give particular importance to the design of new efficient stationary phases for HPLC. New trends in chromatographic separations have been directed towards the use of multi-modal stationary phases (MM-SPs) which are high resolution, high selectivity, high loading capacity, high speed, minimal solvent consumption compared with single-modal stationary phases (SM-SPs).

Methodology & Theoretical Orientation: A humic acid based stationary phase was prepared by immobilizing humic acid onto aminopropyl silica via an amide linkage formation and used for the separation and quantification of three different drugs. Besides, a central composite design with three factors (% ACN, flow rate, and pH of mobile phase) and five levels was used to optimize the separation of drugs and to assist the development of better understanding of interactions between several factors affecting on the separation.

Findings: The main effects, interaction effects, and quadratic effects were optimized and evaluated in this design. In the evaluation of the design; retention time (tR), resolution (RS) and capacity factor values (k') are taken into consideration. In this context, optimum conditions for good separation of six different drugs were selected as in follows: ACN %: 44.8; pH: 7.5 and flow rate: 1.75 mL/min and the baseline separation of six different drugs were achieved in 10 min. For real application of the developed method, the selected six drugs were also analyzed on the human plasma.

Conclusion & Significance: The developed EC-ImHA-APS stationary phase has good chromatographic properties with high efficiency, excellent resolution, and symmetrical peaks for each drug compound. So, it can be used as a stationary phase which is alternative to commercial ones.

Recent Publications

1. Topkafa M, Ayyildiz HF (2017) "An implementation of central composite design: Effect of microwave and conventional heating techniques on the triglyceride composition and trans isomer formation in corn oil" International Journal of Food Properties, 20(1), 198–212.
2. Topkafa M, Ayyildiz HF, Memon FN, Kara H (2016) "New potential humic acid stationary phase toward drug components: development of a chemometric-assisted RP-HPLC method for the determination of paracetamol and caffeine in tablet formulations" Journal of Separation Science, 39(13), 2451–2458.
3. Ayyildiz HF (2015) "Evaluation of new silica-based humic acid stationary phase for the separation of tocopherols in cold-pressed oils by normal-phase high-performance liquid chromatography" Journal of Separation Science, 38, 813–820.
4. Ayyildiz HF, Topkafa M, Kara H, Sherazi STH (2015) "Evaluation of fatty acid composition, tocols profile and oxidative stability of some fully refined edible oils" International Journal of Food Properties, 18(9), 2064–2076.
5. Ayyildiz HF, Kara H (2014) "A highly efficient automated flow injection method for rapid determination of free fatty acid content in corn oils" Journal of the American Oil Chemists' Society, 91(4), 549–558.

Biography

H Filiz Ayyildiz works at Selcuk University as Associate Professor. Her Doctorate thesis was improvement of oil analysis methods by automated flow injection systems. She also works in various fields and has quite a lot of experience. Her working subjects are as follows: Chromatographic separation for food, pharmaceuticals etc., Membrane technology and removal of some ions from aqueous solution by membrane systems, investigation of humic acid properties and its metal sorption capacity: both batch and continuous systems, investigation of continuous solid phase extraction systems for metal ion concentration and removal of them, voltammetric and polarographic assays of electrochemical properties of some organic substances, improvement of flow injection analysis (FIA) techniques for edible oil analysis.

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