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Design and optimization of a simulated moving bed unit for the separation of betulinic, oleanolic and ursolic acids mixtures: experimental and modeling studies

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Abstract

Betulinic, oleanolic and ursolic acids are naturally occurring triterpenic acids that have attracted considerable interest due to their nutraceutical and pharmacological properties. These compounds can be extracted from natural sources, however, their simultaneous occurrence and very similar structures make their separation a challenging task.

In this work we designed a simulated moving bed (SMB) unit for the separation of a representative natural extract containing betulinic, oleanolic and ursolic acids into high purity compounds using a two-step process: firstly, betulinic acid was isolated from oleanolic and ursolic acids, and secondly oleanolic and ursolic acids were fractionated. Preliminary HPLC experiments were conducted to select appropriate mobile and stationary phases. Equilibrium and mass transport parameters were determined through breakthrough experiments with pure compounds in a single column. Subsequently this information was successfully applied in the simulation of a ternary mixture separation, whose results were validated with ternary breakthrough measurements. Finally, the SMB was designed and optimized using a Design of

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