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Analysis of guest binary mixtures by tert-butylcalix[6]arene using host memory of previously bound guests

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Abstract

A new principle of quantitative and qualitative analysis of binary organic mixtures is offered, which is based on an ability of calixarene receptor for specific polymorphic transitions related to the composition of the analyzed guest mixture. The ability of tert-butylcalix[6]arene to remember selectively some guests bound from headspace both of pure liquids and their binary mixtures is used. The image of guest mixture remains written in metastable polymorphs of host after partial or complete guest elimination from clathrates. The memory was read using differential scanning calorimetry as the enthalpy of exothermic polymorphic transition of host collapse. This enthalpy monotonously changes with the variation of guests' ratio in mixture, unlike the enthalpies of endothermic pseudopolymorphic transitions of guest release. So, the composition of volatile binary mixture can be estimated using only one receptor and only one its parameter even in absence of preferential binding from a binary mixture of guests. This is an example of a genuine molecular recognition. © 2013 The Royal Society of Chemistry.

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