

FUNCTIONALIZED CALIXARENES AS TRANSPORTERS THROUGH LIQUID MEMBRANE

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Introduction

Calixarenes have attracted considerable interest in the growing field of supramolecular chemistry. By their availability and easily functionalization at either the upper or lower rim of the molecular skeleton among potential building blocks, calixarenes have become attractive receptors, versatile molecular scaffolds for self-assembling system such as molecular capsule and well-defined functional nanostructures [1-3]. The ability of calix[n]arenes to encapsulate the biological compounds recommends them as useful biomimetic receptors in separation processes. Our current research has focused on the use of calix[n]arenes in analytical applications such as solvent extraction and transport through liquid membranes in separating some biological compounds (Fig. 1).

Results

The transport of amino acid methylesters through liquid membrane by *p*-tert-butylcalix[4]arene as carrier is smaller than that of *p*-tert-butylcalix[n]arenes ($n = 6, 8$) as carriers. In the membrane system, *p*-tert-butylcalix[8]arene exhibits better transport ability than both *p*-tert-butylcalix[n]arenes ($n = 4, 6$) for amino acids methylesters through chloroform liquid membrane, except L-tryptophane with *p*-tert-butylcalix[6]arene.

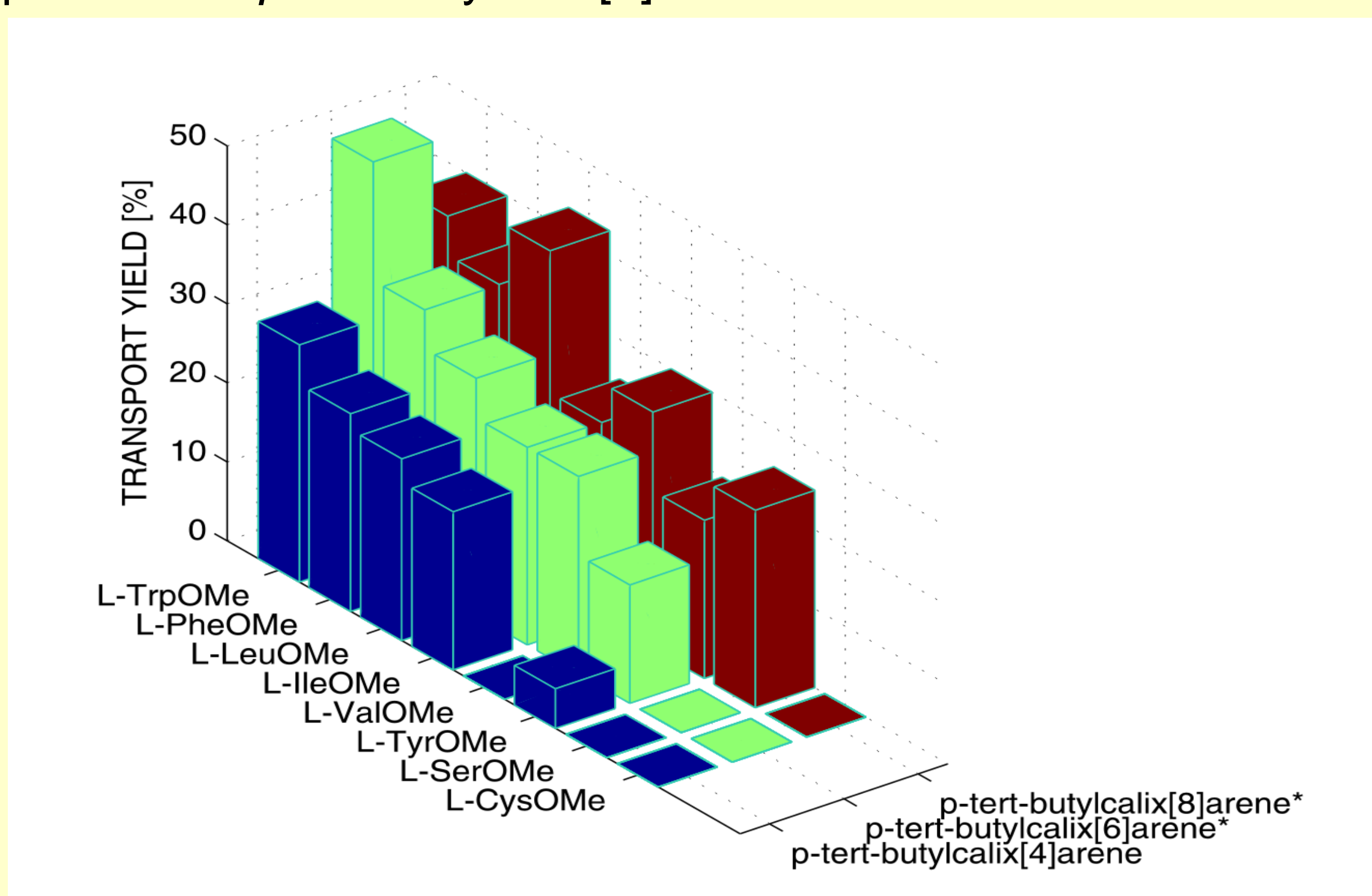


Figure 2. The transport yield of some amino acid methylester hydrochlorides through chloroform liquid membrane by *p*-tert-butylcalix[n]arenes ($n = 4, 6, 8$) as carriers in the presence of tropaeolin 00 after 24 hours of stirring 200 rpm. $T = 298.15$.

Source phase: [amino acid methylester] = 3×10^{-3} M; pH = 5.0
[tropaeolin 00] = 1×10^{-3} M; 10 mL
Membrane: Chloroform, [calixarene] = 5×10^{-3} M, 35 mL
Receiving phase: LiOH 0.01N (pH = 13.0); 10 mL

The sequence of decreasing transport yields of amino acids using *p*-tert-butylcalix[4]arene as carrier is the following: L-TrpOMe > L-PheOMe > L-LeuOMe > L-TyrOMe. The sequence of the transport yields of amino acids using *p*-tert-butylcalix[6]arene as carrier is the following: L-TrpOMe > L-PheOMe > L-LeuOMe > L-IleOMe > L-ValOMe > L-TyrOMe and with *p*-tert-butylcalix[8]arene as carrier the sequence of amino acid yields becomes: L-LeuOMe > L-TrpOMe > L-PheOMe > L-ValOMe > L-IleOMe > L-SerOMe > L-TyrOMe. (Fig. 2). In the membrane system, the *p*-tert-butylcalix[8]arene exhibited better transport ability than both *p*-tert-butylcalix[n]arenes ($n = 4, 6$) for the amino acids methylesters through chloroform liquid membrane, except L-tryptophane with *p*-tert-butylcalix[6]arene.

Conclusions

p-tert-butylcalix[n]arenes ($n = 4, 6, 8$) were found to act as useful carriers through chloroformic liquid membrane for amino acids methylesters in the presence of tropaeolin 00 ([4-(*p*-anilinophenylazo)benzenesulphonic acid]) as counterion at pH = 5.0. The transport depend on the structure of calixarenes, the structure of amino acids, the pH, and the nature of anion used as ion pair for cation-receptor complexes. The results demonstrated that the inclusion properties of the investigated hosts are correlated with their structural properties and also they suggest further possibilities for optimal separation of amino acids derivatives.

References

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Acknowledgements

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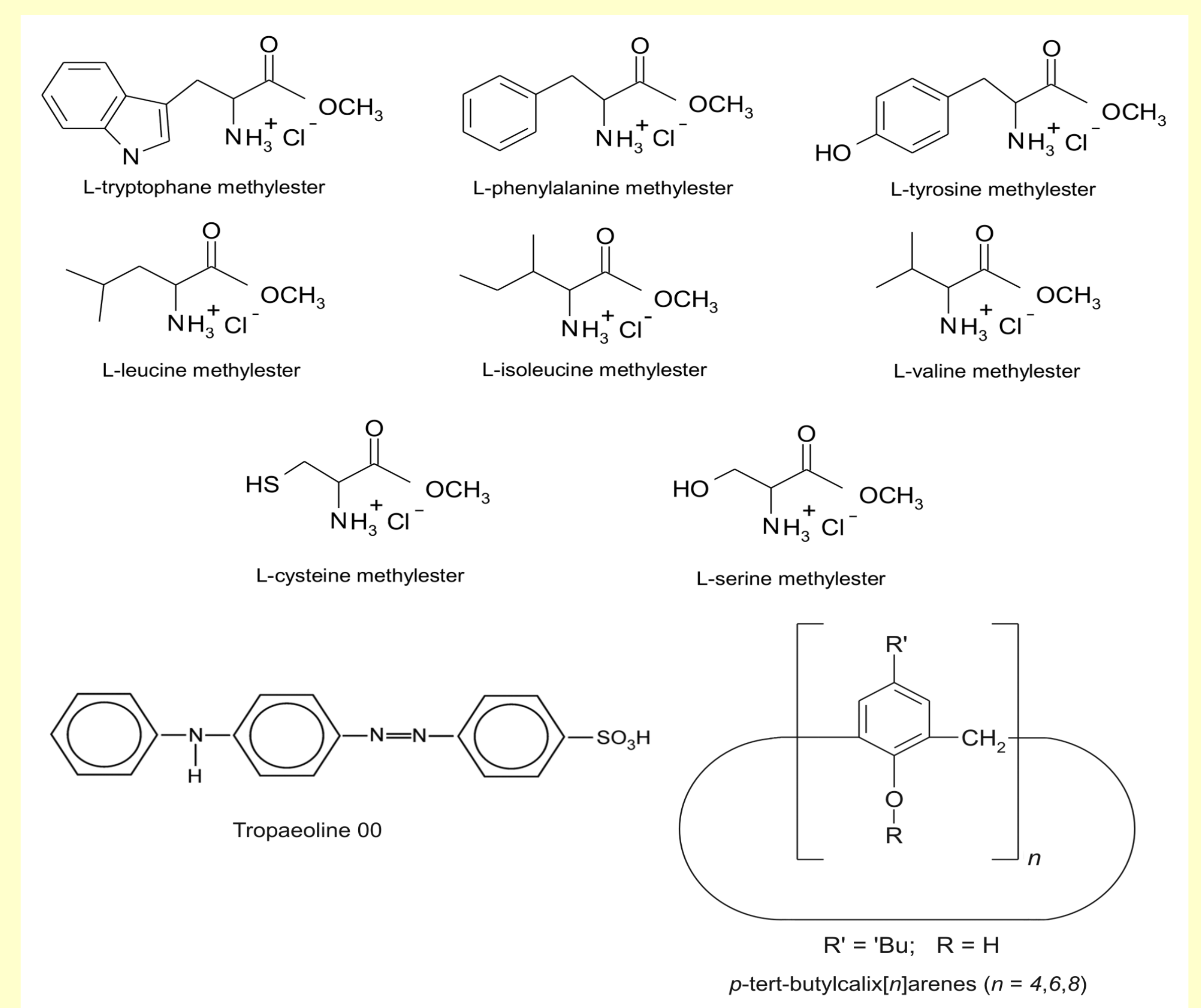


Figure 1. The structure of amino acids, calix[n]arenes, and anion used in experiments.

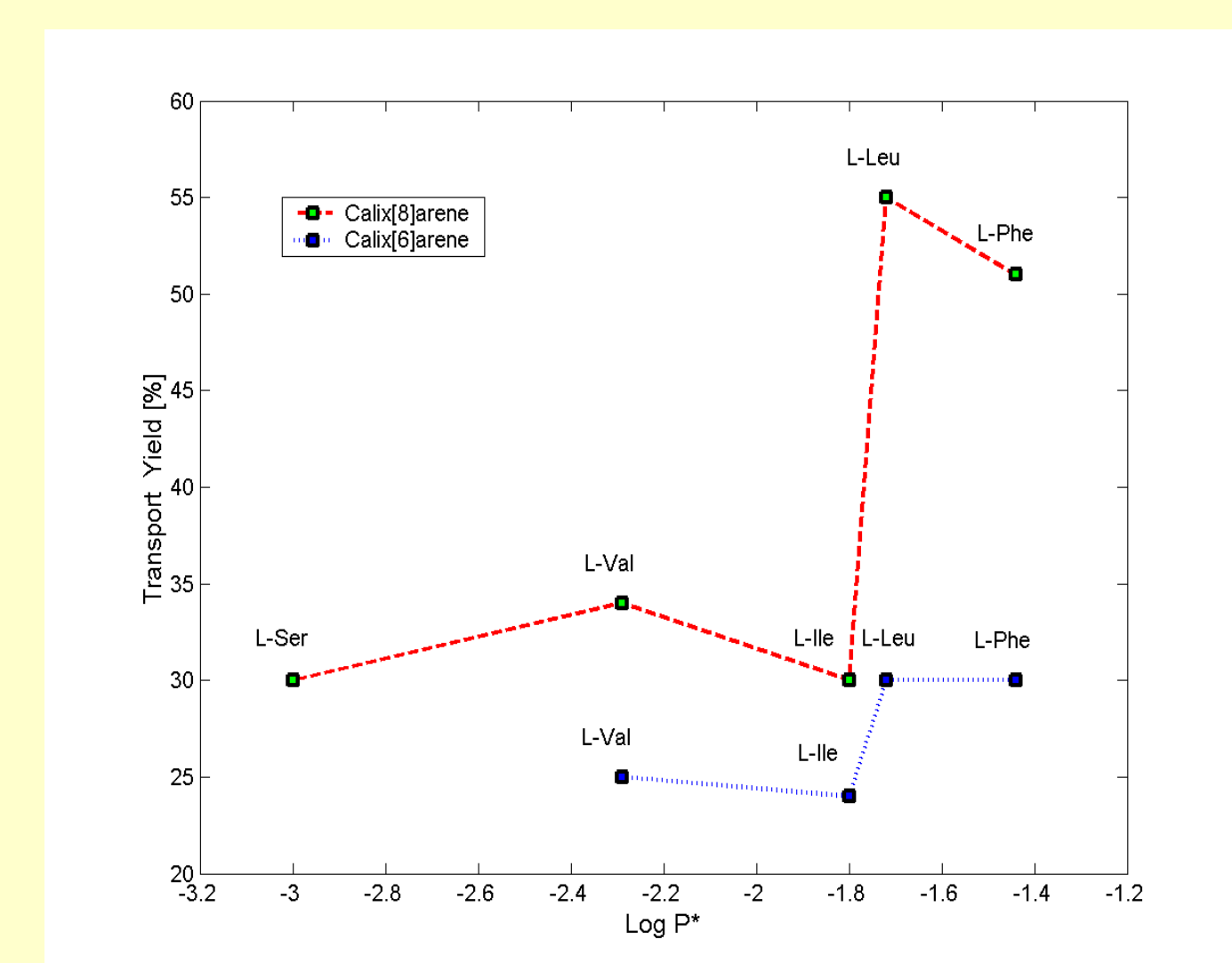


Figure 3. The relationship between the yields (%) of amino acid methylester hydrochlorides transport through liquid membrane by *p*-tert-butylcalix[n]arenes ($n = 6, 8$) in the presence of tropaeolin 00 and their hydrophobicity ($\log P^*$). * N.L. Tayar et al. *J. Chem. Soc., Perkin Trans. 2*, 79 - 84, 1992