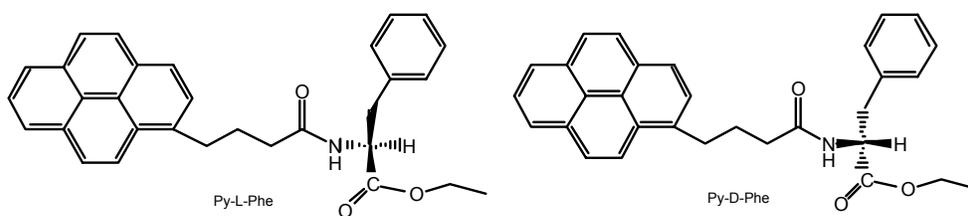


Development of a chiral pyrene probe to study the chiral discrimination in host-guest complexes

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The objective of this project is the development of a probe to study chiral recognition and dynamics of guest binding to host molecules. Our work builds on a preliminary report which reveals that N-[4(1-pyrene)butyryl]-L-phenylalanine (Py-L-Phe) and Py-D-Phe show chiral discrimination when binding to bovine serum albumin (BSA)[1].



Py-L-Phe and Py-D-Phe methyl and ethyl esters were selected as probe molecules for their fluorescence properties such as long lifetimes and because pyrene has been extensively used as a probe in the Bohne group[2-4]. The Py-L-Phe and Py-D-Phe esters were synthesized using N,N'-diisopropylcarbodiimide (DIC) as a coupling agent. Column chromatography was used for purification. A HPLC protocol, using absorbance and fluorescence spectra, was developed to check the purity of the compound, which photophysical studies require to be greater than 99%. Impurity levels were lower than 0.2%.

We are extending the previous report in the literature by using time-resolved techniques to study the binding of the probe to BSA. In addition, to learn more about the mechanism for chiral discrimination, a structurally better defined host system than BSA was needed. For that purpose, α , β , and γ -cyclodextrin (CD) were used. Cyclodextrins are bucket-shaped molecules that vary in size, α -CD being smallest, β -CD medium, and γ -CD the largest. Previous studies have revealed that while pyrene does not fit in α -CD, it does fit in β -CD, and potentially more than one pyrene molecule can be enclosed by γ -CD[3-5]. Also, the phenylalanine moiety on the Py-L-Phe ethyl ester could potentially fit in α -CD. Already it has been found that the Py-L-Phe ethyl ester shows different fluorescence properties between the various cyclodextrins. Steady state and time resolved experiments have been used to further study the fluorescence of Py-L-Phe and Py-D-Phe ethyl esters in the CD host system.

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