

# Arsenic Coordination Chemistry & Anion-π

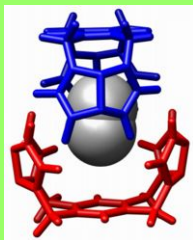
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## INTRODUCTION

Host-Guest chemistry is the study of interactions with two or more ions or molecules held together by ionic attraction, hydrogen bonding or van der Waals forces in unique configurations.

The Darren Johnson lab has been collectively working on various projects involving arsenic in supramolecular structures. As a separate project in the Darren Johnson lab, Orion Berryman and Aaron Sather work with compounds containing electron deficient aromatic rings.



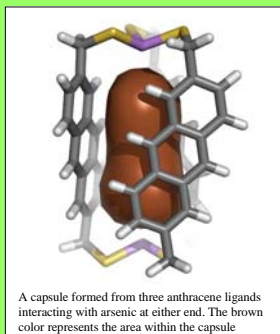
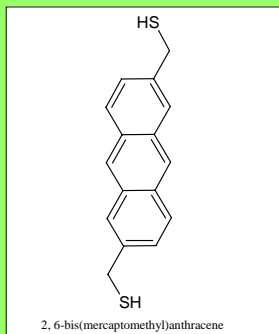
A Hydrogen bonded host molecule containing a gas. Nicknamed "Rebek's Tennis ball" <sup>1</sup>

## ARSENIC CHEMISTRY

Arsenic poisoning is an issue in the United States and worldwide. Poisoning of groundwater is endemic in Bangladesh where as many as 85 million of a population of 125 million are in danger of drinking contaminated water every day.

The anthracene based ligand shown below fluoresces under ultra-violet light. When the ligand reacts with arsenic trichloride, it self-assembles into a molecular capsule with the arsenic bonding to the thiols.

Current research with this capsule involves examining conditions for quenching the fluorescence of the molecules after reacting with arsenic, providing a possible simple quantitative test for arsenic in solution, or arsenic extraction. The lone pairs on the arsenic may also influence guest molecules within the capsule based on their orientation.

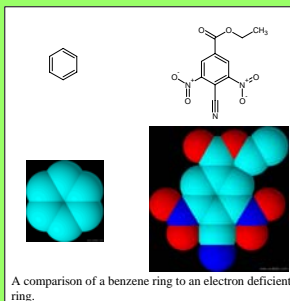


## ELECTRON-DEFICIENT AROMATICS

### TRIOI

Electron-deficient aromatic rings provide a unique interaction with anions. Their attraction along with the planar shape of the aromatic ring allow for interesting host-guest complexes. One proposed design is based off a cup shaped, triol based receptor.

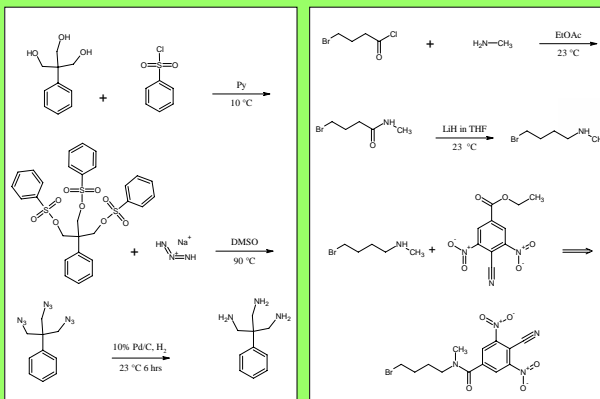
The original triol is reacted with *p*-toluene sulfonyl chloride. This process called "tosylation" replaces the very nucleophilic OH group with a more stable resonance structure that is easy to remove. This complex is then reacted with sodium azide to remove the leaving group and replace it with N<sub>3</sub>. Reduction of this compound leaves amine functionality. The amine groups can then be coupled to electron-deficient aromatic rings creating a cup shaped receptor.



### MOLECULAR TETHER

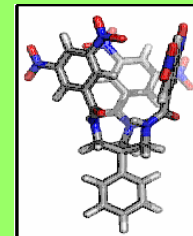
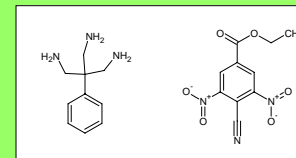
When functional groups are coupled to other functional groups they are considered to be tethered to that functional group. In this case, a substitution reaction will be observed when a bromine is tethered to an electron deficient aromatic ring.

4-bromo butyl-1-chloride is reacted with a methyl amine to form 4-bromo butyl-1- amide. This amide is reduced and then reacted with the electron-deficient aromatic ring to form the tether structure.



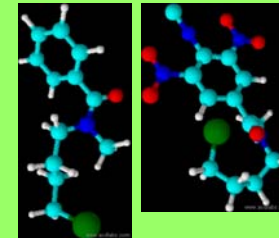
## FUTURE DIRECTIONS: TRIOL RECEPTOR

The triol receptor will have various anions interact with its electron-deficient host area. Anions planned for interaction include halogens and polyatomic anions.



## FUTURE DIRECTIONS: MOLECULAR TETHER

In a substitution reaction the bromine will be removed from the structure. In the tethered structure, it is theorized that the electron-deficient ring will attract the bromine towards it making the overall rate of reaction faster than it would be for a structure lacking the electron-deficient ring.



## REFERENCES

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2. W. Jake Vickaryous, Rainer Herges, and Darren W. Johnson\* *Angew.Chem. Int. Ed.* **2004**, *116*, 5955.
3. W. Jake Vickaryous, Elisabeth Rather-Healey, Orion B. Berryman, and Darren W. Johnson\* *Inorg. Chem.* **2005**, *44*, 9247.
4. Romain Viguier, Guy Serratrice, Agnes Dupraz, and Claude Dupuy *Eur. J. Inor. Chem* **2001**, 1789.

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