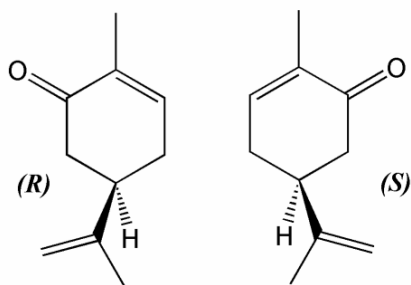
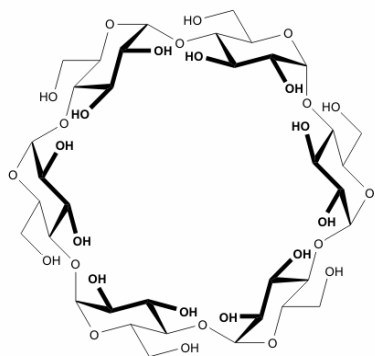


Chiral Analysis of Monoterpenes by Capillary Electrophoresis

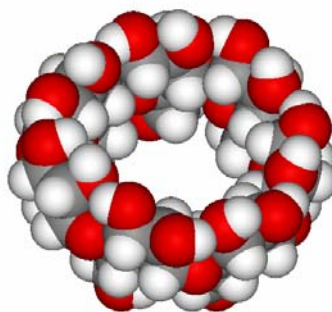
Carvone is an interesting natural product derived from spearmint leaves, caraway seeds and other plants. Carvone is an example of a monoterpene and its structure is shown below. Carvone is chiral (handed) and comes in two forms (termed enantiomers). The enantiomers are mirror-image isomers of each other. Interestingly, *S*-(+)-carvone smells like caraway. Its mirror image, *R*-(-)-carvone, smells like spearmint. The fact that the two enantiomers are perceived as smelling differently is proof that olfactory receptors must contain chiral groups, allowing them to respond more strongly to one enantiomer than to the other.



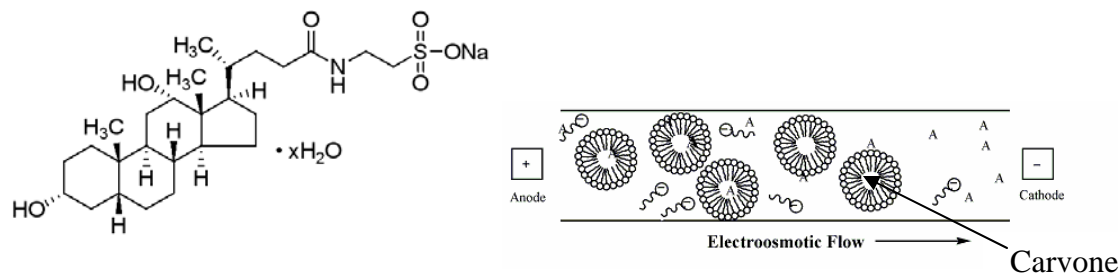
We have recently developed a capillary electrophoresis method for separating the enantiomers of carvone. The technique is called micellar electrokinetic chromatography, and consists of a buffer containing a soap-like molecule, taurodeoxycholic acid and alpha-cyclodextrin molecule, shown below. Both of these molecules are chiral and help to recognize the two enantiomers in the separation. α -cyclodextrin probably interacts with the carvone by forming an inclusion complex with the carvone, although our initial NMR studies do not reveal this. Taurodeoxycholic acid is a steroidal bile salt derived and forms a chiral micelle



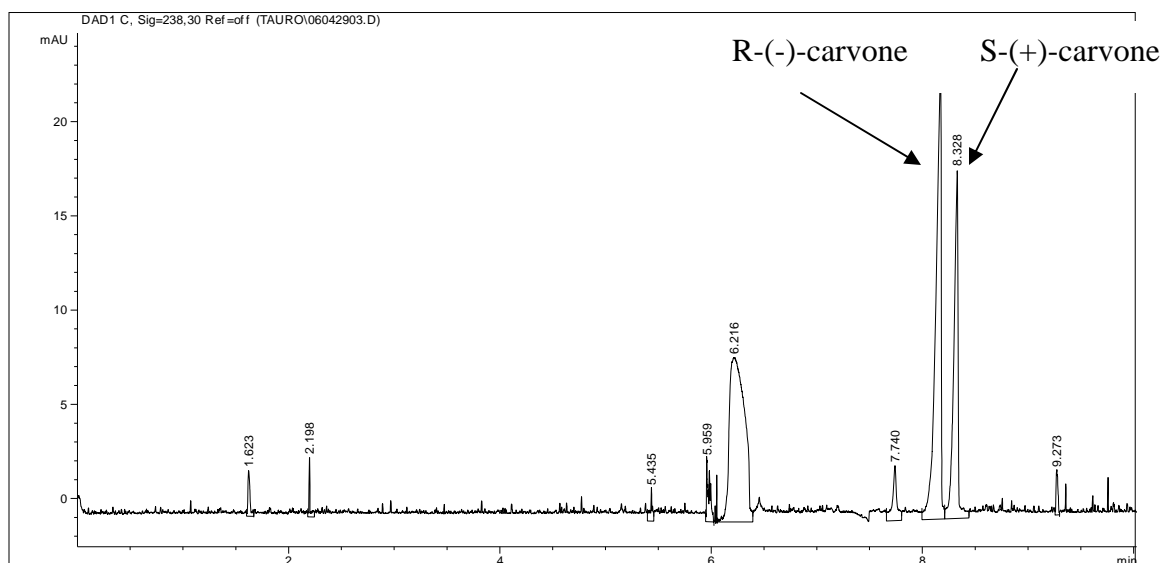
α -cyclodextrin



3-D Structure showing Donut-like shape



Taurodioxocholic acid, sodium salt – forms a micelle in the capillary into which carvone partitions.



We are interested in extending this technique to other monoterpenes including α -pinene, β -pinene, camphene, and limonene, which are all chiral, but do not contain oxygen atoms. These molecules may represent particular challenges in separation using this techniques.

References:

Practical Capillary Electrophoresis, R. Weinberger, Academic Press, 2000.

K. H. Gram, et al Journal of Chromatography A, 759 (1997), 149-155.