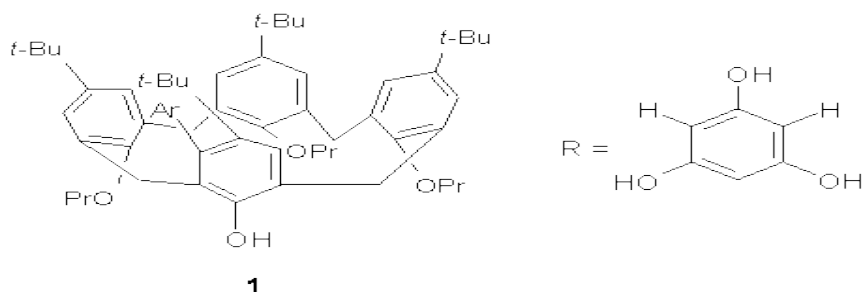


# OPTICAL ACTIVITY OF A CHIRAL CALIX [4] ARENE

Determination of absolute configuration remains a difficult undertaking, one usually solved by x-ray crystallography. In my book (Chapter 1.6.3) and blog (see these posts) I have noted the use of computations in conjunction with optical rotation or electronic circular dichroism as an alternative: possible configurations are optimized and their optical properties are computed and then matched against experimental spectra.

Neri and coworkers have utilized this approach to determine the absolute configuration of the chiral calix[4]arene **1**.<sup>1</sup>

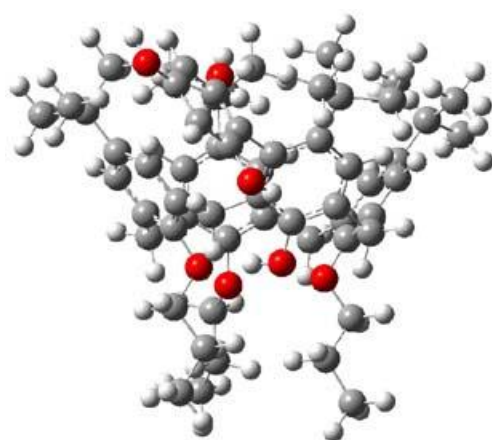


Computed optical rotations (TDDFT/B3LYP/6-31G\* at 5 frequencies) are compared with experimental values in Table 1. While the magnitude is off (as is typical) the sign of the activity along with the trend matches up very well for

the *cS* configuration shown in Figure 1. It should be noted that a second conformation makes up about 10% of the Boltzmann population, and the contribution of this second configuration is included in the computed values shown in Table 1. In addition, computations at higher levels give very similar results. Lastly, the computed ECD spectrum of the *cS* isomer also matches up well with experiment.

**Table 1.** Optical rotation of the *cS* isomer of **1** compared with experiment

Wavelength (nm)	Experiment	Computed
589.3	108	58.8
577	120	61.7
546	140	70.2
435	264	122.6
405	367	147.6



**Figure 1.** B3LYP/6-31G\* optimized structure of the major conformation of **1**.

Given the relatively low level of theory employed here, further use of this combined experimental/computational approach to obtaining absolute configurations of large molecules is encouraged.

Source: <http://comporgchem.com/blog/?p=1066>