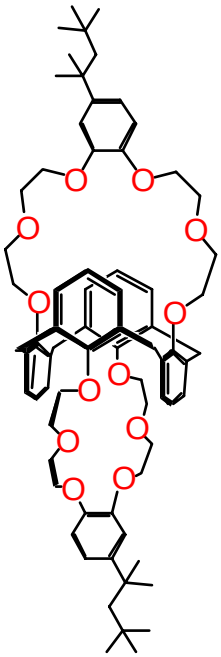
pH-Switchable Cesium Extractants Show Promise for More Efficient Waste Cleanup

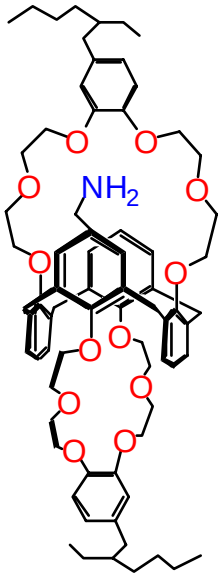
A proof-of-principle experiment has shown that a prototype generation of new pH-switchable cesium extractants offers up to three-fold greater stripping efficiency. In principle, if this single-stage improvement is propagated in a multi-stage flowsheet, a smaller, more efficient, and less expensive plant for cleanup of high-level waste could be designed. The results were recently published in a journal article describing extraction experiments using new calixarene-crown ether extractants bearing amino substituents. Except for the amino substituents, the new extractants closely resemble BOBCalixC6, the calixarene-crown that is currently targeted for use in the Salt Waste Processing Facility being designed for cleanup of high-level waste at the Savannah River Site starting in 2010. Under acidic stripping conditions, the amino groups in the new extractants become protonated, and it is thought that the resulting charged ammonium groups repel the bound cesium, resulting in its release. Planned experiments are aimed at testing this hypothesis, improving the pH-switching efficiency, and increasing the solubility and robustness of this exciting new family of extractants.

The recently published paper is as follows:

Bazelaire, E.; Gorbunova, M. G.; Bonnesen, P. V.; Moyer, B. A., and Delmau, L. H. pH-switchable Cesium Nitrate Extraction with Calix[4]arene Mono- and Bis(benzocrown-6) Ethers Bearing Amino Functionalities. *Solvent Extr. Ion Exch.* **2004**, *22*(4), 637–661.



Calix[4]arene-bis(*t*-octylbenzo-crown-6)
BOBCalixC6



Aminomethyl-calix[4]arene-bis(ethylhexylbenzocrown-6)
AMBEHB