Dual-host combinations: From enhancing cesium nitrate extraction to attenuating the Hofmeister "bias"

Konstantinos Kavallieratos,[1,2] Jeffrey C. Bryan,[1] Richard A. Sachleben,[1] Gary J. Van Berkel,[1] Melissa A. Kelly,[1] Andrew M. Danby,[3] Kristin Bowman-James,[3] and Bruce A. Moyer[1]

[1]Chemical and Analytical Sciences Division, Oak Ridge National Laboratory, P. O. Box 2008, MS-6119, Oak Ridge, TN 37831-6119

[2]Department of Chemistry, Florida International University, 11200 SW 8th St. CP-326, University Park, Miami, FL 33199

[3]Department of Chemistry, University of Kansas, Lawrence, Kansas 66045-0046

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Ion-pair recognition and extraction by synthetic hosts is an area of intense interest, with promising analytical and environmental applications. We recently demonstrated that the use of simple carboxamides derived from trimesic acid or tren bearing a C_3 symmetric skeleton as anion receptors together with a crown-ether cation host can enhance extraction of the $CsNO_3$ ion pair via binding of the co-extracted anion. The use of simple disulfonamides as anion hosts together with a cesium-selective calix-crown as cation host resulted in synergism strongly biased toward small anions ("Anti-Hofmeister"), with remarkably uniform dependence on the standard Gibbs energies of transfer for the anions OAc^-, Cl^-, Br^-, I^-, NO_3^-, and ClO_4^-. NMR titrations and Electrospray Ionization Mass Spectrometry support the distribution results, and the association constants for anion complexation correlate well with the extraction enhancements. X-ray structural data further exemplify the role of hydrogen bonding in anion binding.