Glenn T. Seaborg Center Seminar

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Applications of Ionic Liquid Technologies to f-Element Separations

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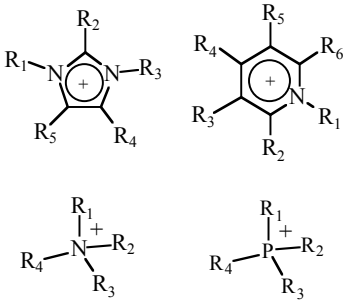
4 pm
Building 70A-3377

Abstract: Ionic Liquids (ILs) are composed of organic cations and either organic or inorganic anions that remain liquid over a wide temperature range, including room temperature. IL characteristics can be dramatically adjusted by anion type or subtly altered by changing the length or number of alkyl groups appended to the cation. We have begun the exploration of actinide separations in a variety of technologies based upon the use of ILs including liquid/liquid extraction using traditional extractants, incorporating an extractant functionality into an IL, immobilizing IL extractant phases on solid supports, and utilization of the solubilizing power of ILs to prepare cellulose-based materials for *f*-element separations. ILs can thus be considered as a new class of materials for nuclear separations with adjustable solvent characteristics, unique properties, and the potential for enhancing the principles of "green" chemistry in these chemical processes.

Actinide separations and related applications have been conventionally performed using molecular solvents such as dodecane, odorless kerosene, and some chlorinated solvents, whose properties in extraction processes have been well studied and established. While these solvents are highly effective in metal ion separations, a new class of solvents has recently emerged that offers the ability to study extraction processes in a unique coordination environment, and the potential to replace many volatile organic compounds.

It has recently been demonstrated that ILs can be used in the solvent extraction of metal ions from acidic aqueous media. ILs are low-melting organic salts that are liquid at, or near, room temperature. As a class, they often possess a wide liquidus range, negligible flammability and volatility, and tunable physical properties based upon modifications to their chemical structures (shown below).

This presentation will overview the use of ILs in actinide and fission product ion separations at The University of Alabama. Results from the use of traditional extractants in ILs, Task-Specific ILs, novel IL-based aqueous biphasic systems, and cellulose-based materials, as well as, spectroscopic coordination studies of aqueous ions, will be presented that illustrate the utility and suitability of ILs as substitutes/alternatives to traditional organic compounds in nuclear-based separations and their application to the study of TRU coordination chemistry.



Common cations

$Cl^-/AlCl_3$
Cl^-, Br^-, I^-
NO_3^-, SO_4^{2-}
CF_3COO^-, $CF_3SO_2^-$
BF_4^-
PF_6^-
$(CF_3SO_2)_2N^-$

Common anions

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