Purification and decontamination for waste containing radioactive, natural or artificial, trace element

A. Favre-Reguillon *et al.*

Despite recent improvements in both sensitivity and selectivity of analytical methods, separation and preconcentration remain essential steps in many chemical analyses. In the determination of radionuclides in environmental and biological samples, the low level of the nuclides typically encountered and the complexity of the sample matrix often preclude direct determination. Separation and preconcentration are also important in the processing of nuclear waste. They make it possible to reduce the volume of materials requiring final disposal and, therefore, lower the cost of waste handling and treatment. We have been working on partitioning for high-level liquid waste during the past 10 years. Our objectives involved the selective extraction of alkali, alkaline-earth metals and platinum group's metals and more recently the group separation of actinides and lanthanides. To reach these objectives, macrocyclic compounds, such as crown ether, thia-crown ether, calixarene and pyridinium containing aza-macrocyclic have been synthesized. Depending on their hydrophilicity, ligands were used in liquid/liquid extraction or nanofiltration-complexation. Characterisation and results obtained with the new compounds and systems are reported. Decontamination of liquid waste as well as gaseous effluent by chelating resins was also studied. Immobilisation of macrocycles on various inert supports, design of new ion-exchange resins with the "template effect" technique and trapping of gaseous radionucleides will be also presented. We describe recent advances in laboratory and process-scale separation techniques for removing and recovering several of the more hazardous elements of the waste constituents.