documented fluoroalkoxy substitution reaction whereby halo groups in a polyhaloaromatic are removed and fluoroalkoxy groups are substituted in their place. A series of model polyhaloaromatics have been subjected to the following studies: (1) homogeneous reaction conditions (typical laboratory scale studies to define the chemical reaction), (2) phase-transfer conditions (heterogeneous mixture under pseudo- environmental conditions), (3) environmental sample conditions (oil- based and/or soil–solid samples), (4) biological activity studies in order to make toxicity and mutagenicity comparisons between the polyhaloaromatics and the fluoroalkoxy products. Studies have been completed for the following model compounds: the 1,2,3-, 1,2,4-, and 1,3,5-trichlorobenzenes; the 1,2,3,4- and 1,2,4,5-tetrachlorobenzenes; pentachlorobenzene; hexachlorobenzene; the dibromo- and difluorobiphenyls. In all cases, reaction parameters have been determined and optimized for converting *all* of the polychloroaromatic to mixtures of chloro-fluoralkoxy substituted products. Biological activity screens (an *in vitro* human skin cells test and the Ames test) have been developed for use with samples generated from the reaction chemistry studies.

Development and validation of neutron activation procedures for metal analysis in municipal solid waste

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Abstract

The analysis of solid waste requires a technique capable of detecting heavy metals in large inhomogeneous samples and of carrying out these measurements nondestructively. Within these constraints one of the few techniques with useful capabilities is neutron activation analysis.

Two forms of Neutron Activation Analysis (NAA) were chosen for this study

due to the penetrating nature of the probe and emitted radiation used in NAA. Instrumental NAA (INAA) were used for those elements which have a neutron capture product that is radioactive; Prompt Gamma NAA (PGNAA) was used in the case of cadmium because the most favorable reaction in cadmium (neutron capture by ^{113}Cd which has a capture cross section of 19,896 barns [1 barn $= 10^{-24}$ cm^2]) yields non-radioactive ^{114}Cd. It was found that the neutron flux from a small plutonium–beryllium neutron source is adequate for the analysis of cadmium in large samples at the ppm concentration level.

A large sample irradiation facility for PGNAA using isotopic (plutonium–beryllium) neutron sources has been constructed and characterized. Results of the PGNAA work will be presented along with various issues of concern in the analysis of large, inhomogeneous samples and in particular, the analysis of municipal solid wastes.

A large sample irradiation facility is being planned for installation and evaluation at the Texas A&M Nuclear Science Center to irradiate samples of municipal solid waste for the analysis of heavy metals by INAA. Preliminary multielement results of the analysis of small samples of composted municipal solid waste will be presented along with a brief comparison of INAA results to atomic absorption results (performed according to procedures in EPA SW-846).

Development of bioreactors for the destruction of chlorinated solvents

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Abstract

Aerobic bioreactors for the removal of chlorinated solvents in groundwaters are a promising alternative to conventional treatment methods. Biodegradation is advantageous because in one step the contaminants are destroyed in addition to being removed from the treated waters. Chloroform, 1,2-dichloroethane, and trichloroethylene (TCE), for example, are degraded at concentrations of 1 to 1000 μg/L by certain heterotrophic bacteria, yielding innocuous end products. The nonspecific oxygenase enzymes of the bacteria enable the cometabolism of the chlorinated solvents.