Bull. Inst. Chem. Res., Kyoto Univ., Vol. 54, No. 6, 1976

LABORATORY OF RADIOCHEMISTRY

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Main subjects of research in our laboratory have been fundamental researches on the partition behavior of inorganic compounds between two phases and their application to analytical chemistry and marine chemistry. The studies which have been carried out during the last decade in our laboratory are divided into several categories, and these are closely related to each other. In the following, a brief description of each will be given.

I. Solvent Extraction Chemistry

Solvent extraction as a method of separation has long been important to the analytical chemistry, in recent years has it been also useful to the fields of solution chemistry, coordination chemistry, and separation chemistry. Some studies in our laboratory were devoted to the synergistic effect in solvent extraction. Recently the research on the liquid-liquid extraction of metal ions in nonaqueous system has been developed. This research is a very interesting problem, because we can gain knowledge of the chemical equilibrium of metal ions in nonaqueous system as well as of the chemical separation.

II. Coprecipitation

Partition of trace metals between the crystal and solution phases has been of general importance not only to the isolation of metal ions initially present in very low concentrations, but also to the incorporation of the heavy metals and the radioisotopes into the bone skeleton and to the distribution of trace metals in marine sediments where the environmental conditions for the formation of the sediments are indicated. We have reported on the coprecipitation of copper, zinc, strontium, cadmium, and lead with hexagonal calcium hydroxyapatite, $Ca_{10}(PO_4)_6(OH)_2$ which is the principal inorganic constituent of human bones and teeth and exists in nature as mineral hydroxyapatite.

The coprecipitation method of metal chelates with organic coprecipitants was also investigated because organic coprecipitants compared with inorganic one had several advantages that they were selective, free from trace elements and easy to filter. This coprecipitation method was applied to "the coprecipitation and spectrophotometric method" in our laboratory and it had the advantages of easiness in chemical treatment, of good selectivity and of a high concentrating efficiency.

III. Analytical Chemistry

1. Optical Methods

In the early years of the last decade the spectrometric and fluorometric methods

were principally investigated. Recently flameless atom reservior atomic absorption spectrophotometry has been studied because of its extremely high sensitivity and applied to the trace metal analysis in sea water and marine organisms.

2. Chromatography

The gas chromatograms of the metal chelates and metal chelate adducts of such fluorinated β-diketones as pivaloyltrifluoroacetone were successfully obtained.

3. Miscellaneous

Studies were undertaken to evaluate the response and selectivity characteristics of liquid membrane electrodes responsive to organic anions such as amino acids and antiseptics. Studies on the radioanalytical chemistry were also performed.

IV. Chelate Chemistry

Iron(II) complexes of 2-(2′-pyridyl) imidazole and its derivatives were prepared and characterized mainly by Mössbauer spectra and their magnetic data, and some of these complexes were found to have a spin equilibrium between $^1A_1$ and $^5T_2$.

V. Marine Chemistry

Chiefly trace metals such as molybdenum, strontium and manganese in marine organisms were determined and discussed.

Publications

(* indicates an article published in Japanese)

I. Solvent Extraction Chemistry

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