

heating brought up all acidic compounds as pink spots on a sky-blue background. If the heating was prolonged and the chromatoplate carefully brought near to the infrared lamp, the pink spots given by keto acids turned white, whereas those given by carboxylic acids remained pink. In this way it was possible to distinguish keto acids from other acids. Exposure of the plate to ammonia vapours for a few seconds resulted in a sharper definition of the pink spots.

Results

Adipic, succinic, glycolic, fumaric, lactic, malic, oxalic, ascorbic, dehydroascorbic, β -ketobutyric, α -ketoglutaric, levulinic and pyruvic acids were subjected to the chromatographic procedure described above.

In Table I are listed the R_F values in the two solvents used.

Experiments are being conducted with the object of extending to other compounds, including sugars, the technique developed in the present work.

*Institute of Agricultural Chemistry,
University of Padua (Italy)*

C. PASSERA
A. PEDROTTI
G. FERRARI

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Ion flotation of inorganic ions

1. The concentration of uranium

Surface active agents may be used for separation processes in a variety of ways such as adsorbing them on solid supports¹, in liquid phases or on a gas-liquid interface².

The possibilities of the last-mentioned, namely ion flotation or froth flotation, have been outlined by several workers³⁻⁶. As in ion exchange processes, however, the adsorption of ions on the surface of the air bubbles formed from an aqueous solution of surface active agents will depend on the ionic state of the ion to be adsorbed, the structure and distribution of the surface active agent (not only on its functional groups) and the pH and ions present in the solution. Thus exact conditions for optimum concentration have to be worked out for each particular case.

In this preliminary communication we wish to describe a typical case, the concentration of UO_2^{++} ions from a solution of ammonium carbonate.

A number of cationic surface active agents was compared in a preliminary study using the apparatus shown in Fig. 1. Optimum results were obtained with benze-thonium chloride. The effects of the carbonate concentration, of the concentration of the surface active agent and of the uranyl ion concentration are shown in Figs. 2 and 3.

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The first and most concentrated foam fractions were analysed for their surface active agent and uranyl ion contents and gave ratios of 4:1, indicating the formation of a salt of the type $R^+_4 UO_2(CO_3)_3^{4-}$ in this process. For the determination of

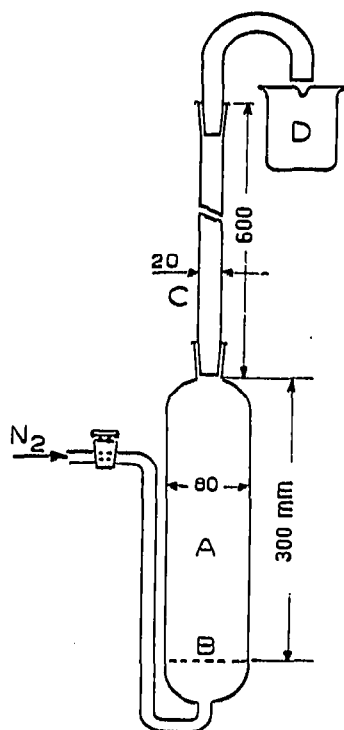


Fig. 1. Apparatus for foam extraction. A = Foam chamber, B = G2 porous septum; C = Glass column; D = Foam container.

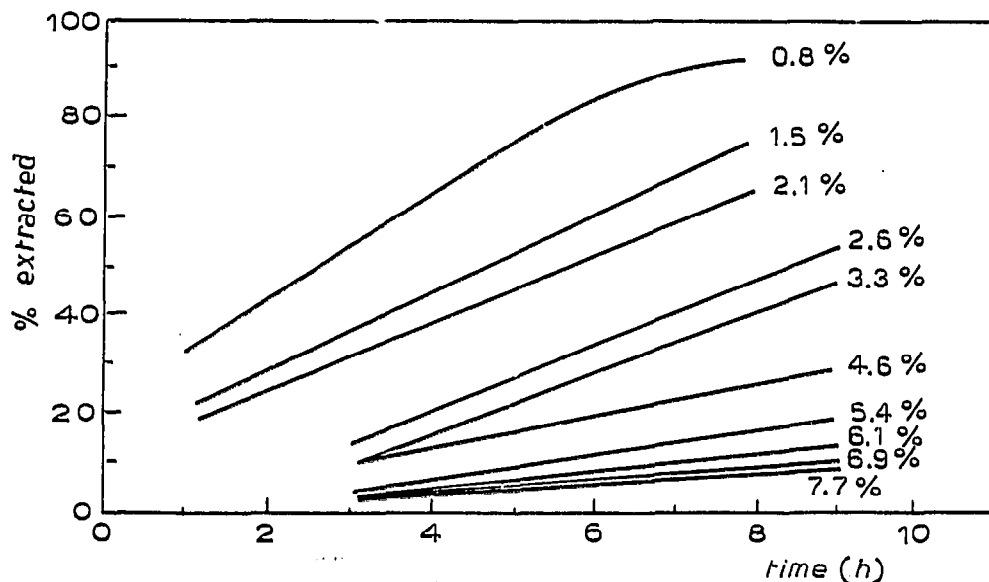


Fig. 2. Influence of the carbonate concentration. Each curve shows the foam concentration of uranyl ion with a flow rate of 75 ml of N_2 /min and 0.2% of BZT solution and an initial concentration of 0.01% $UO_2(NO_3)_2 \cdot 6H_2O$. Each curve represents a concentration of ammonium carbonate (in g/100 ml).

benzethonium, spectrophotometry at $240\text{ m}\mu$ gave good results in the required range of concentrations. Experiments with anionic exchange resins showed similar adsorptions with various carbonate concentrations as obtained in foams. It seems that a

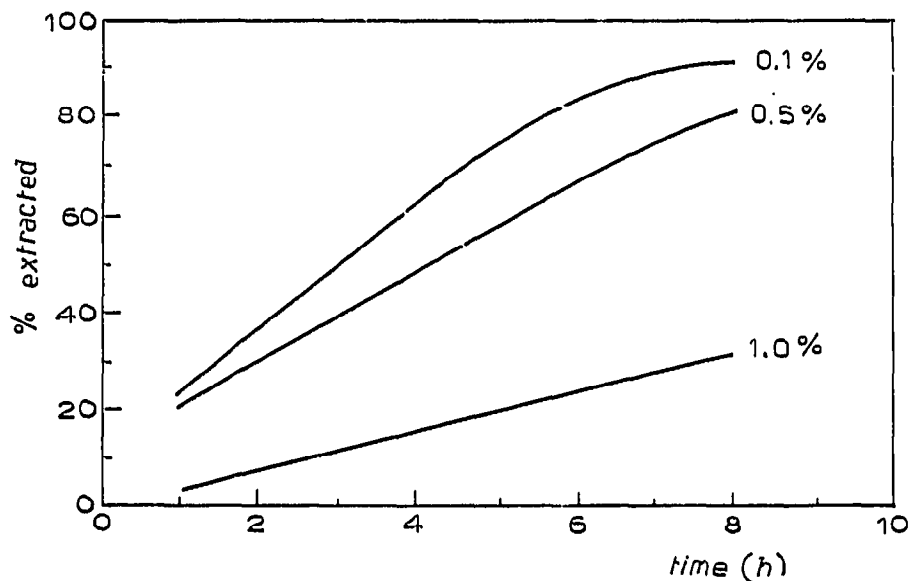


Fig. 3. Effect of foaming agent concentration. The foam concentration of UO_2^{++} with a flow rate of 75 ml of N_2 /min and 3.75% ammonium carbonate and an initial concentration of 0.01% $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$. The curves show the % extracted with time for 0.1%, 0.5% and 1% of BZT.

broad analogy between ion flotation and ion exchange can be inferred even for the working conditions such as carbonate concentration, pH, etc. A similar correlation was also noted in froth flotation of the EDTA-complex of U(VI) which may be separated at pH 8 (where it is anionic) and not at pH 3 where it is cationic.

Paper chromatographic experiments as outlined in a previous communication⁷ yielded the same information as actual flotation experiments. A mixture of the surface active agent and uranyl ions remained strongly adsorbed near the point of application when developed with 1% ammonium carbonate solution but was separated into a fast moving uranium spot and an adsorbed surface active agent spot when developed with 10% ammonium carbonate.

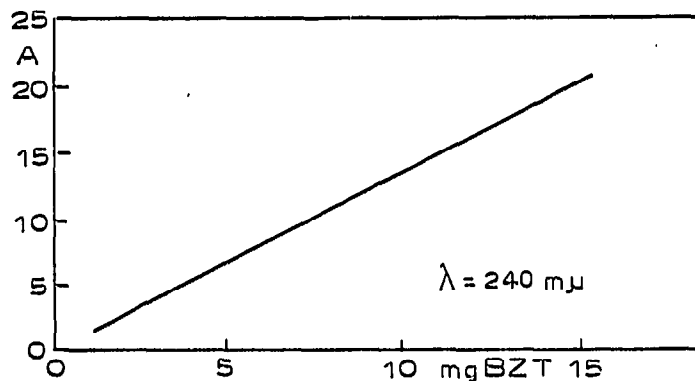


Fig. 4. Absorption at $240\text{ m}\mu$ plotted against concentration of BZT (in mg).

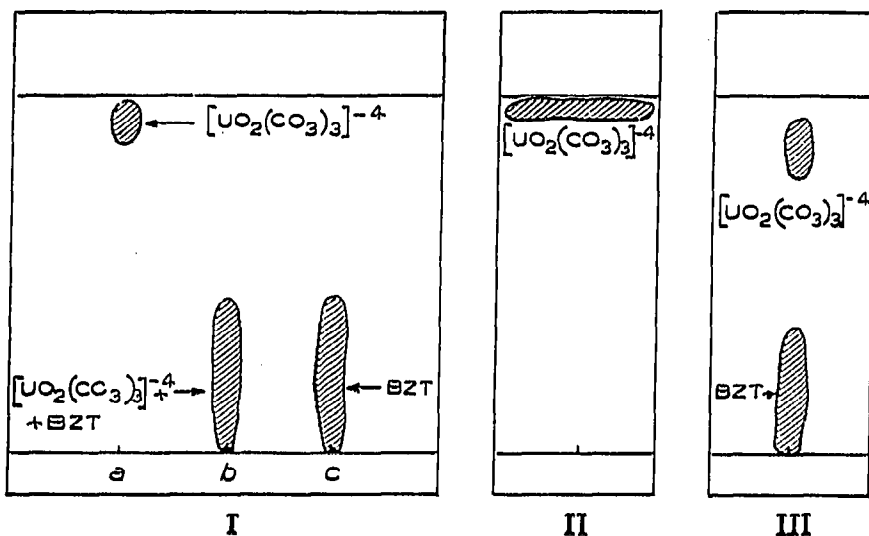


Fig. 5. Paper chromatograms of mixtures of uranyl carbonate and BZT. Paper: Whatman No. 1. I: a-c solvent = 1% aqueous ammonia carbonate; a = uranium carbonate only; b = mixture of uranium carbonate and BZT; c = BZT only. II: solvent = 1% aqueous ammonium carbonate containing 3% BZT. A spot of uranium carbonate was placed on the paper. III: solvent = 10% aqueous ammonium carbonate. A mixture of uranyl carbonate and BZT was chromatographed and separated into a fast moving uranium spot and a strongly adsorbed BZT spot.

The details of this work as well as some other separations of radiochemical interest will be described elsewhere.

*Laboratorio di Chimica delle Radiazioni del C.N.E.N.
e Istituto Superiore di Sanità, Centro di Chimica Generale
del C.N.R., Istituto di Chimica Generale ed Inorganica
dell'Università di Roma, Rome (Italy)*

ALBERTO BAROCAS
CARLA IACOBELLI-TURI
FRANCO SALVETTI

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