RADIOCHEMICAL STUDIES IN RETENTION BEHAVIOUR OF CHROMATE AND OTHER IONIC SPECIES ON SELECTED IONIC SOLIDS

BY

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To

My eldest didi and jijaji
An easy way to thank
For it was always yours

CERTIFICATE

This is to certify that the thesis entitled, " Radiochemical Studies in Retention Behaviour of Chromate and Other Ionic Species on Selected Ionic Solids" being submitted by Mrs. Santosh to the Indian Institute of Technology, Delhi for the award of the degree of Doctor of Philosophy, is a record of bonafide research work carried out by her. Mrs. Santosh has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis, which to my knowledge, has reached the requisite standard.

The results contained in this thesis have not been submitted in part or in full, to any other University or Institute for the award of any degree or diploma.

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(SANTOSH)

ABSTRACT

The thesis embodies the results of an investigation on the carrying of chromate and other specified ions on sulphates and iodates of lead, barium and strontium, using the radioisotopes as indicators.

The thesis is presented in five parts:

Part I comprises of an introduction including a resume of the work done by earlier workers having a bearing on the present investigation, scope and object of the present work and the description of the materials and methods used for the experimental work.

Part II is devoted to the study of carrying of tagged chromate ion by the preformed carriers. The deposition study involves an examination of the influence of pH, in the absence as well as presence of certain lattice and non-lattice ions (e.g., barium, strontium, lead and sulphate); in addition, influence of certain ions, non-lattice as well as lattice (e.g., barium, strontium, lead and sulphate/iodate), on the course of instantaneous carrying of the tracer has been thoroughly investigated. Study of the influence on carrying of time of aging of the different freshly made carriers, and also of the time of contact of the radioactive tracer with the fresh as well as aged adsorbents has been carried out. The experimental data reveals that the carrying is very much influenced by the above mentioned factors.

The experimental results obtained in the investigation have been interpreted with a view to arrive at the mechanism of the carrying with particular reference to: (i) nature of the carrying; (ii) probable composition of the carried entity; and (iii) location of the carried tracer in the body of the carrier. The results generally indicate that carrying takes place superficially on ignited carriers and also internally on fresh carriers, by the counter ion exchange mechanism.

Part III includes similar experimental study on the deposition of $^{32}PO_4^{3-}$ on ignited as well as freshly precipitated $Pb(IO_3)_2$, $Ba(IO_3)_2$ and $Sr(IO_3)_2$. In part IV, some aspects of retention behaviour of $^{99}MoO_4^{2-}$, $^{35}SO_4^{2-}$ and $^{185}WO_4^{2-}$ on ignited $PbSO_4$ $BaSO_4$ and $SrSO_4$ have been included.

Finally, in part V a radioactive indicator study has been attempted to examine the feasibility of concentrating the microgram quantities of these species from extremely dilute solutions by subsequent desorption of the activity carried under optimum conditions in the light of above studies. The findings may also find some applications in problems of disposal of radioactive waste at low concentration level.

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