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IN STRONGLY ACID MEDIA**

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IN STRONGLY ACID MEDIA

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The retention of tantalum by hydrated antimony/V/ oxide, HAP, was studied in nitric, hydrochloric, and perchloric acids at various concentrations. The tantalum capacity of HAP in nitric acid was determined and the kinetics of the retention were studied at 25 °C.

INTRODUCTION

The systematic work of Girardi et al.^{1,2} on the retention of various elements by ionic precipitates has shown that precipitates of hydrated antimony/V/ oxide /HAP/ have a high selectivity for sodium. From strongly acid media, only tantalum and sodium are quantitatively, whereas fluorine only partly retained by HAP.

Bourelly et al.³ and Viallate et al.⁴ have studied the retention of alkali metals and fluorine on HAP in the presence of various acids, as a function of the acid concentration and time of contact. The capacity of HAP for alkali metals was also determined.

Of the mentioned elements retained by HAP in strongly acidic media only the behaviour of tantalum was not investigated in detail.

In the present paper an investigation on the retention of tantalum by HAP is described. We determined the retention of tantalum by HAP as a function of the contact time in nitric, perchloric and hydrochloric acids. The influence of the acid concentration on the retention was also investigated, and the maximum tantalum capacity of HAP was determined.

EXPERIMENTAL

Commercial HAP, RA 1-Carlo Erba was used. Labelled solutions of tantalum were prepared by irradiating about 3 mg of metallic tantalum in a thermal neutron flux of $10^{12} \text{ ncm}^{-2} \text{ sec}^{-1}$ for 5 days, adding tantalum carrier, and dissolving the metal in hydrofluoric acid after a cooling period of 6 days. The excess of fluoride ion was removed. The final concentration of the solution was 39.6 μg tantalum per ml.

Batch equilibration experiments were carried out at 25.0 ± 0.1 °C. A mixture of 10 ml labelled, acidic tantalum solution and 500 mg HAP was agitated.

After centrifuging, the activity of tantalum in the solution was determined and compared with the activity of a standard tantalum solution. A 400-channel analyzer coupled to a 3" x 3" well-type NaI scintillator was used for the determination of the peak area at 67 keV for ^{182}Ta .

RESULTS

Fig.1 shows the percentage of retention R of tantalum as a function of time in 20 and 50 ml 1M nitric acid. Figs.2 and 3 present the data for 1M hydrochloric and perchloric acid, respectively.

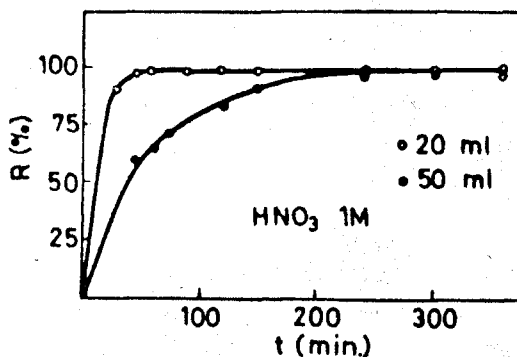


Fig.1. Percentage of retention by 1 g HAP as a function of contact time in 1M nitric acid

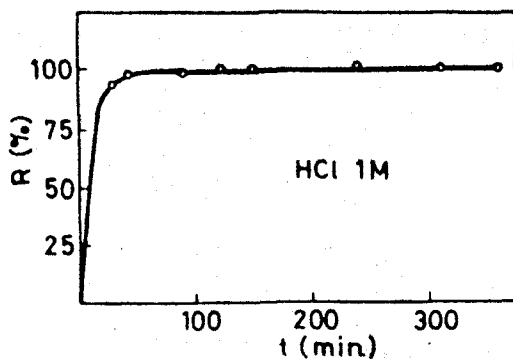


Fig.2. Percentage of retention by 1 g HAP as a function of contact time in 1M hydrochloric acid

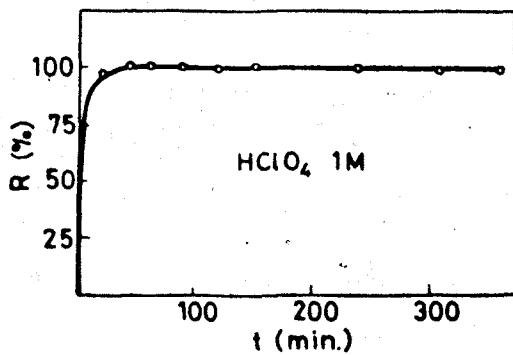


Fig.3. Percentage of retention by 1 g HAP as a function of contact time in perchloric acid

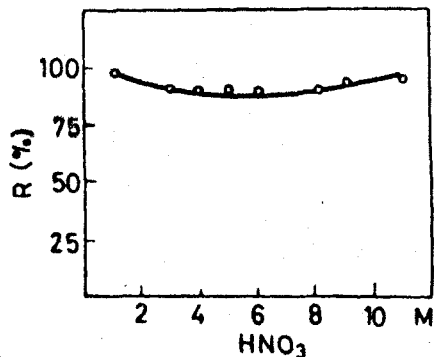


Fig.4. Percentage of retention as a function of the molarity of nitric acid. Time of equilibration: 90 min

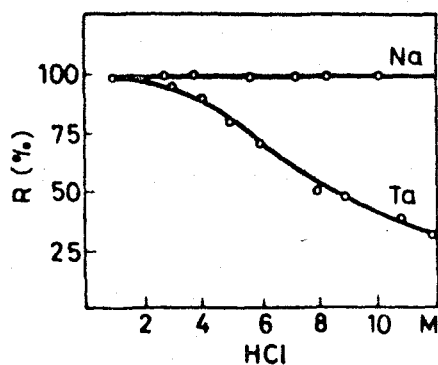


Fig.5. Percentage of retention as a function of the molarity of hydrochloric acid. Time of equilibration: 90 min

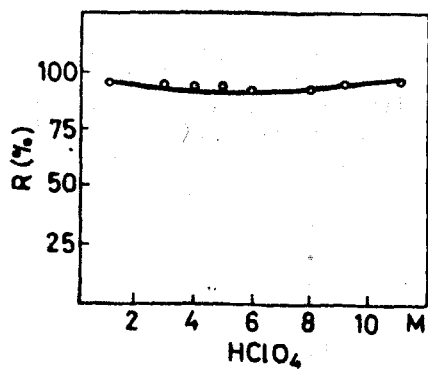


Fig.6. Percentage of retention as a function of the molarity of perchloric acid. Time of equilibration: 90 min

Figs. 4, 5 and 6 show the percentage of retention as a function of acid molarity for nitric, hydrochloric and perchloric acids after a contact time of 90 min. Results for sodium in hydrochloric acid are also plotted.

Fig. 7 gives the tantalum capacity of HAP in 1M nitric acid. The contact time was 180 min.

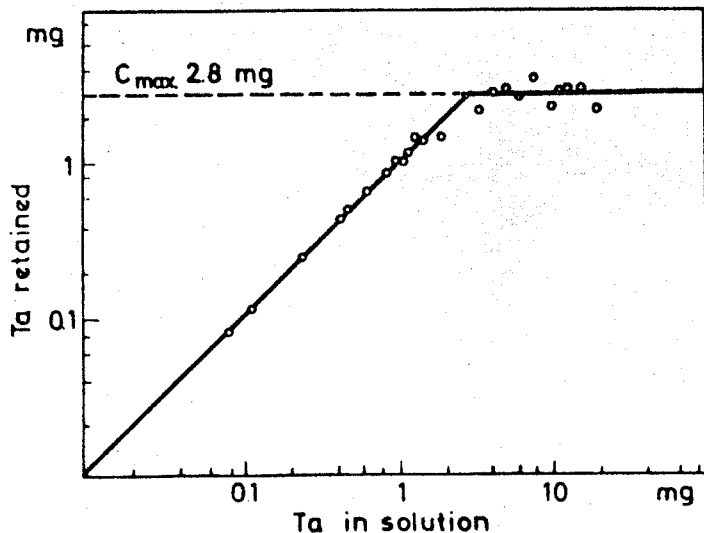


Fig. 7. Retention capacity of HAP for tantalum in 1M nitric acid. Contact time: 180 min

DISCUSSION

The tantalum capacity of HAP in 1M nitric acid is 2.8 mg Ta/g HAP, which is a lower value than that obtained for sodium.

Girardi et al.² claimed that at high hydrochloric acid concentrations only tantalum and sodium were retained by HAP. The results presented in Fig. 5 indicate a possible separation of sodium from tantalum after both elements have been retained by HAP. Namely, by extending the contact time of HAP with hydro-

chloric acid up to about 90 min. only about 25% of the tantalum is retained. Separation might also be achieved by passing hydrofluoric acid through a column filled with HAP, which has retained both elements. According to Girardi's results,² tantalum is not retained by HAP in hydrofluoric acid, although sodium is.

Fig.1 indicates that the time required to reach the maximum retention capacity for tantalum in nitric acid is dependent on the concentration of tantalum, since for the same amount of tantalum the equilibrium is reached in a shorter time for a smaller solution volume.

Retention of tantalum by HAP is practically independent of the concentration of nitric or perchloric acid but it decreases upon increasing the hydrochloric acid concentration when equilibrated for 90 min.

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SUMÁRIO

Foi feito o estudo da retenção de tântalo em pentóxido de antimônio hidratado, HAP, em função da natureza e concentração dos ácidos nítrico, clorídrico e perclórico. A capacidade de retenção do tântalo no HAP foi determinada em meio nítrico 1M. Foi estudada a cinética de retenção do processo a 25°C.

RÉSUMÉ

On a étudié la rétention du tantale par le penthoxyde d'antimonium hydraté HAP, en fonction de la nature et de la concentration de l'acide nitrique de l'acide chlorhydrique et de l'acide perchlorique. La capacité de la rétention du tantale par le HAP a été déterminée en milieu nitrique 1M. La cinétique de la rétention a été étudiée à 25°C.