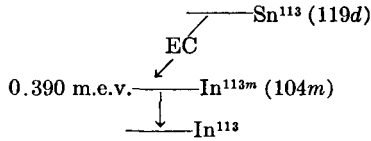


### Ionic Selectivity of Hydrolyzed Polyethylene Terephthalate

It has been observed experimentally that hydrolyzed polyethylene terephthalate shows a phenomenon of ionic selectivity when dipped in  $\text{Sn}^{113}$  solutions.  $\text{Sn}^{113}$  used in  $\text{SnCl}_2$  solutions, decays to  $\text{In}^{113m}$  according to the following decay scheme:



time, or the secular equilibrium count rate, and  $t$  is the time at which the count rate is calibrated.

The first term in eq. (1) corresponds to the decay of the initial  $\text{In}^{113m}$ , i.e., the amount present immediately following removal of the sample from the solution. The second term results from the  $\text{In}^{113m}$  activity build-up from the mother nuclide  $\text{Sn}^{113}$ . The half-life used in this computation is that of  $\text{In}^{113m}$ , 104 min. The dots and crosses of the figure show the excellent fit between the experimental data and calculated values.

The fact that secular equilibrium attained in solution is disrupted on the tape points out the selective sorption of the tin on the hydrolyzed polymer. Since the indium concentration in solution is vanishingly small compared with

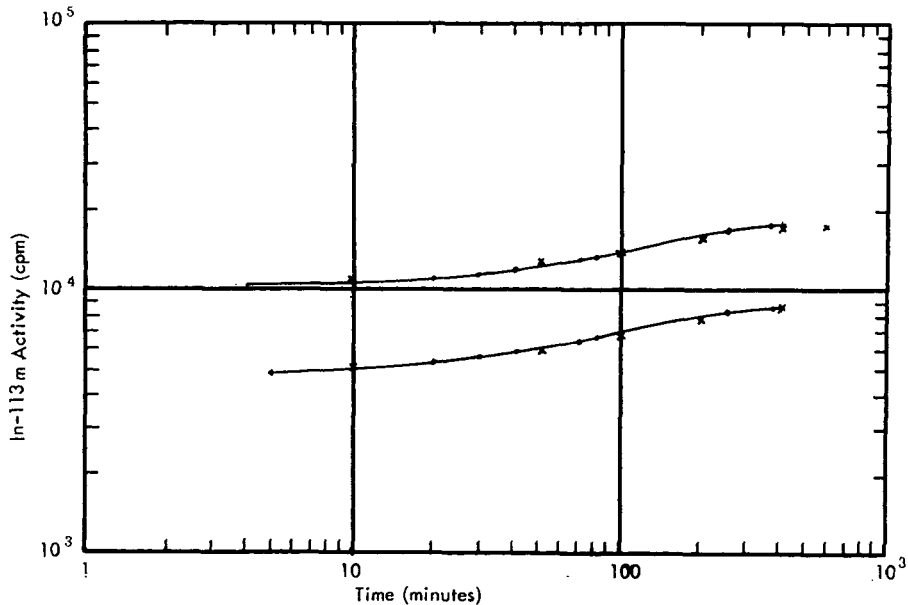


Fig. 1. Ionic selectivity of hydrolyzed polyethylene terephthalate: (●) computed values; (x) experimental points.

A so-called secular equilibrium is reached in solution between the two radionuclides  $\text{Sn}^{113}$  and  $\text{In}^{113m}$  and corresponds to a constant ratio of the two. Radioactivity measurements made on the hydrolyzed polymer after it has been dipped in  $\text{Sn}^{113}$  solutions show increasing count rates as a function of time (see Fig. 1). The experimental observation can be expressed mathematically by:

$$Q = Q_i e^{-\lambda t} + Q_\infty (1 - e^{-\lambda t}) \quad (1)$$

where  $Q$  is the total count rate at time  $t$ ,  $Q_i$  is the initial count rate at time  $t = 0$ ,  $Q_\infty$  is the count rate for an infinite

time of tin, this phenomenon may be explained by the difference in sorption probabilities. On the other hand, the observed experimental facts might suggest ion exchange properties of the hydrolyzed polymer.

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