



Five additional low-molecular-weight products were tentatively identified by taking a low-voltage mass spectrum of the vapours of the most volatile components of the crude product mixture: methane, acetylene, ethylene, propyne and propene. Small amounts of C_8 products, which have not yet been completely resolved by gas chromatography, are also formed¹².

The mass spectra of a number of the other eight C_5 and C_6 components agree reasonably well with published mass spectra, but we do not feel justified in speculating about their structure until the relatively large quantities needed for nuclear magnetic resonance spectra have been collected. The polymer is not of great interest, for it is formed on the walls by a presumably heterogeneous mechanism.

It is only recently that analysis of complex product mixtures has been feasible^{1,10,11}, using gas chromatography. Our experiments differ from those involving continuous reaction of simple compounds as a means of studying formation of complex structures under primordial conditions¹⁻⁴ in that we plan, by using a flow system and condensing the effluent with liquid nitrogen, to find out what products are formed initially and to study the reaction mechanisms in more detail.

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Chemical Effects of Nuclear Recoil following (n, γ) Reactions in Bromates

THE chemical distribution of radioactive recoil atoms arising from nuclear reactions in solid state is the consequence of a series of complicated processes and depends on many factors such as the nature of nuclear reaction, the chemical environment of the recoiling atom and the conditions of experiment. Investigation of the effects of these factors on the chemical fate of recoil atoms is required to clarify the mechanism of the whole recoil process. The present communication describes the recoil effects of $^{79}Br(n, \gamma)^{80m}Br$ and $^{81}Br(n, \gamma)^{82}Br$ reactions in a variety of bromates. The isotope effect reported by Jach and Harbottle for alkali bromates¹ was also found for bromates of other metals. The retention of radioactive bromine atoms as bromate was found to be affected by the basicity of the cation.

Bromates shown in Table I were subjected to neutron irradiation in a pneumatic tube of the JRR-1 reactor for

5 min. The irradiated salts were stored at dry-ice temperature until dissolution to prevent annealing reactions. The salts were dissolved in water containing a small amount of potassium bromide. Each solution was passed through a column of cation exchanger to eliminate radioactive cations. Bromine species of lower oxidation states were separated by the procedure of precipitating bromide as silver bromide. Completeness of separation and absence of isotope exchange reactions were checked with ^{82}Br as tracer. The radioactivity of ^{80m}Br in the aliquots taken from the solutions before and after the separation was measured by means of a Geiger-Müller counter. The β -ray from ^{82}Br was absorbed with an aluminium foil. The radioactivity of ^{82}Br was measured with a sodium iodide scintillation counter, after ^{80m}Br had decayed out.

The results of the average of five determinations for each salt are shown in Table 1.

Table 1. THE RETENTION OF RADIOBROMINE AFTER (n, γ) REACTIONS IN BROMATES

	^{80m}Br (%)	^{82}Br (%)
NaBrO ₃	12.6 ± 0.3	14.2 ± 0.3
KBrO ₃	12.8 ± 0.2	14.6 ± 0.2
Mg(BrO ₃) ₂ ·6H ₂ O	14.5 ± 0.3	18.4 ± 0.4
Ba(BrO ₃) ₂ ·H ₂ O	11.7 ± 0.3	12.4 ± 0.2
Al(BrO ₃) ₃ ·9H ₂ O	27.0 ± 0.3	31.5 ± 1.3
TlBrO ₃	8.9 ± 0.2	7.2 ± 0.1
Co(BrO ₃) ₂ ·6H ₂ O	15.2 ± 0.3	18.2 ± 0.2
Ni(BrO ₃) ₂ ·6H ₂ O	14.8 ± 0.3	19.0 ± 0.3
Cu(BrO ₃) ₂ ·6H ₂ O	17.4 ± 0.4	22.2 ± 0.3
Cu(BrO ₃) ₂ ·2H ₂ O	14.0 ± 0.3	15.9 ± 0.4
Zn(BrO ₃) ₂ ·6H ₂ O	14.8 ± 0.4	20.8 ± 0.4

In any bromate investigated, except for thallos salt, the retention of ^{82}Br was higher than that of ^{80m}Br . Jach and Harbottle showed that in alkali bromates a difference in retention between both isotopes appeared when the irradiated salts were subjected to thermal treatment¹. It was not possible to decide whether or not the difference in retention observed in the investigation reported here was caused by thermal annealing, since the irradiation was carried out at pile temperature. The higher retention for the bromates of metals of lower basicity may suggest participation of the cations in recoil reactions. Anomalous behaviour of thallos salt might be related to the oxidation-reduction reaction between thallos and thallic ions.

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Why is the PSO_3^{3-} Ion the Predominant Ionic Species of Phosphorothioic Acid that reacts with Alkylhalogenides?

IN a series of earlier papers (summarized in ref. 1) it was shown that phosphorothioic acid reacts with a number of alkylhalogenides (substituted and unsubstituted) and with certain cyclic compounds, such as ethylene oxide², with the formation of acids of the general formula $RSPO_3H_2$. The sulphur atom was shown to be the sole reactive site of phosphorothioic acid in this type of reactions.

A closer examination of the mechanism revealed that of the various existing ionic species of phosphorothioic acid the triply charged anion, PSO_3^{3-} , was the predominant reactive one². This was found to be true whether the phosphorothioate ion reacted with charged or with uncharged compounds. When cations, such as: