The $\bar{\lambda}_{tr} = f(\nu_0)$ dependences were processed by using the method of least squares, whereby the following regularities were obtained: for diphenyl: $\bar{\lambda}_{tr} \sim \nu^{0.33 \pm 0.03}$, for monoisopropyl diphenyl: $\bar{\lambda}_{tr} \sim \nu^{1.58 \pm 0.12}$. A similar data processing was also performed for Dowtherm [1], which yielded the following dependence: $\bar{\lambda}_{tr} \sim \nu^{0.82 \pm 0.06}$.

The dependences $\bar{\lambda}_{tr}$ on the neutron velocity for different organic liquids sharply differ from each other regardless of the identical structure of the materials. This indicates that neutrons are differently thermalized in these substances. For diphenyl, the neutron spectrum differs from a Maxwellian spectrum to the least extent.

In view of the weak dependence of $\bar{\lambda}_{tr}$ on the neutron energy for diphenyl, it can be assumed that the energy of internal interaction in diphenyl is much lower than the energy of interaction with neutrons, so that the model of a heavy monoatomic gas can be applied to diphenyl in the first approximation.

By using the Nelkin's method [2], we can calculate the diffusion cooling coefficient

$$c_D = \frac{\left(\frac{\alpha^2}{2} \int \bar{\lambda}_{tr} \nu^2 \right)}{\nu_0^2 M_2}$$

If we assume that $\bar{\lambda}_{tr} \sim E^\alpha$, where $\alpha$ is a free parameter;

$$M_2 = \frac{1}{(kT)^2} \int_0^\infty \int_0^\infty \Sigma(E \rightarrow E') \Sigma(E' \rightarrow E) M(E) dE \nu E'$$

is the second moment of the energy of neutrons with the medium (here,

$$M(E) = E e^{-E/kT}$$

Nelkin calculated the value of $M_2$ for a heavy monoatomic gas model. By using the experimental $\alpha$ and $D$ values and considering that $\Sigma(E \rightarrow E') \Sigma(E' \rightarrow E) M(E) dE \nu E'$, the constants $c_D$ were calculated. The nondiffusion correction amounted to 2%, it could be neglected. The experimental error in determining $(c_D - c_T)$ was equal to 16%. The theoretical and experimental values agree within the limits of measurement errors. Such agreement does not exist in the case of monoisopropyl diphenyl and Dowtherm, as was to be expected.

**LITERATURE CITED**


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**GAS AND GRAVIMETRIC METHODS OF ANALYSIS OF SODIUM FOR THE OXYGEN CONTENT AND THEIR USE FOR THE ANALYSIS OF THE CONTENTS OF OXIDE TRAPS**

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During the development of cold traps for the removal of oxygen from sodium [1], after the completion of tests it was necessary to determine the oxide content, both as a whole and in individual parts of the trap. The particular feature of the analysis was that the weight of the sample was several kilograms, while the oxide content was several percent. Therefore, such analytical methods as the mercury [2], butyl bromide [3] and distillation [4] methods could not be employed in our case.
We decided on the use of gas and gravimetric methods of analysis, these being simpler and more convenient. Their shortcoming is that the analysis accuracy depends markedly on the oxygen concentration and is poor at low concentrations.

**Gas analysis.** The basis of this method is that during the reaction of sodium and its oxides with water or ethyl alcohol, hydrogen is obtained only at the expense of sodium metal.

![Diagram of the gas analysis apparatus](image)

**Fig. 1.** Diagram of the gas analysis apparatus.

If the volumes of hydrogen and alkali obtained during the experiment are \( V_{H_2} \) and \( V_{NaOH} \) (liters) respectively, and the alkali concentration is \( C_{NaOH} \) (g/liter), the amount of oxides in the analyzed sample \( G_{Na_2O} \) (g) may be calculated from the equation

\[
G_{Na_2O} = \frac{M_{Na_2O}}{2} \left( \frac{V_{NaOH} C_{NaOH}}{M_{NaOH}} \frac{2V_{H_2}}{V_0} \right),
\]

where \( M_{Na_2O} \) and \( M_{NaOH} \) are the molecular weights of sodium oxide and sodium hydroxide respectively; \( V_0 \) is the volume of one mole of gas at S.T.P. The meaning of the other symbols was given above.

The contents of two traps were analyzed by this method. A diagram of the experimental apparatus is given in Fig. 1. This shows the analyzed trap 1; vessels 2, 3, and 4 for alcohol and the collection of alkali and hydrogen; and the condenser-trap 5 for separation of water and alcohol from hydrogen.

![Diagram of the apparatus for determining the volume of the sample](image)

**Fig. 2.** Diagram of the apparatus for determining the volume of the sample.

**TABLE 1.** Comparison of the Results of Gas Analysis with Data Obtained from Gravimetric Oxide Determination

<table>
<thead>
<tr>
<th>Expt. No.</th>
<th>Data of oxide indicator</th>
<th>Gas analysis data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (variant 1)</td>
<td>900 ± 100 g</td>
<td>1400 ± 600 g</td>
</tr>
<tr>
<td>2 (variant 10)</td>
<td>4750 ± 450 g</td>
<td>4530 ± 680 g</td>
</tr>
</tbody>
</table>

The amount of oxides in the traps, determined by gas analysis, is given in Table 1. For comparison, the latter also gives the amount of oxides in the traps, calculated from gravimetric data [1].

It is characteristic that in both experiments the solution contained an insoluble residue. Spectral-chemical analysis of the latter showed that in addition to oxides the cold trap retains products of the corrosion of the materials from which the apparatus is made, calcium and other elements.

**Gravimetric analysis.** This method is based on the fact that there is more than 100% difference in the specific gravities of sodium and its oxides. In the given case the problem of determining the oxide concentration \( C \) consists in the determination of the volume of the sample \( V(\text{cm}^3) \) and its weight \( G \) (g) with subsequent calculation by the equation

(continued)