ized hyperons resulting from the absorption of K^- mesons by nucleons from filled shells of the nucleus, however the sign of $\overline{P}_Y$ will persist.

I am grateful to I. S. Shapiro for discussions.

Translated by A. M. Bincer
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HEAT OF MIXING OF LIGHT AND HEAVY WATER

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It seems at first glance that the thermal effect in mixing H_2O and D_2O should be very small, since a mixture of molecules of different isotopes could be considered to a high degree of approximation as an ideal solution. But account must be taken of the chemical interaction between the molecules of the initial substances:

$$H_2O + D_2O \rightleftarrows 2HDO. \tag{1}$$

A value $K = 3.26$ is usually taken[1] for the equilibrium constant of the above reaction in the liquid phase. This means that when one mole of H_2O and 1 mole of D_2O are mixed, 0.95 moles of HDO is formed.

The properties of the H_2O and D_2O molecules have been investigated in sufficient detail, but the same cannot be stated with respect to the molecules of HDO, since they always occur mixed with H_2O and D_2O. If the heat of mixing q of light and heavy water and the equilibrium constant of the reaction (1) are known, the heat of formation q' of HDO, when H_2O and D_2O react in the condensed phase, can be determined directly, and certain conclusions can be drawn from this regarding the difference in the zero-point energies of the different isotopic forms of water molecules.

The heat of mixing of H_2O and D_2O (99.7%) was determined in a hermetically sealed reversing calorimeter provided with a heater and a thermistor. A cooling of the system (by $\approx 0.3°C$) was observed on mixing (up to a molecular concentration of deuterium $n \approx 0.5$). The temperature of the external container was adjusted to the temperature of the calorimeter. The correction for heat exchange did not exceed 2.5% of the magnitude of the effect observed. The thermal capacity of the system was determined in the course of the experiment.

As the result of experiments (at 24°C) the following value for the heat of mixing (heat is absorbed) was obtained for the case $n = 0.50$, taking into account possible errors: $q = 7.92 \pm 0.25$ cal/mole.

If we assume the equilibrium constant for the reaction (1) in the liquid phase to be equal to 3.26, we shall obtain for the heat of formation of 1 mole of HDO (not taking into account the effect due to the heavy isotope of oxygen O^{18}) the value $q' = 16.7 \pm 0.5$ cal/mole. This value can be compared with the results of calculations for the gas phase. To do this, we make use of the theoretically calculated dependence of the equilibrium constant on the temperature,[2] and the well-known thermodynamic relation[3]

$$\partial \ln K / \partial T = \Delta H / RT^2, \ \Delta H = 2q'.$$

From this we obtain $q' = 34$ cal/mole. A decrease in the heat of formation of HDO in the condensed phase, compared with the gaseous phase, may be due to a strong intermolecular interaction in solution and to the associated change in the zero-point energies.

I express my gratitude to V. M. Kostin for his help in carrying out the experiments.

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[1] A. I. Brodskii, Химия изотопов (Chemistry of Isotopes), Acad. Sci. Press, Moscow, 1957.

[2] I. Kirschenbaum, Heavy Water, IIL, Moscow, 1953.

[3] M. A. Leontovich, Введение в термодинамику (Introduction to Thermodynamics) Gostekhizdat, Moscow-Leningrad, 1952.

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MEASUREMENT OF β-γ CORRELATION FROM ORIENTED NUCLEI

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In connection with the problem of nonconservation of parity, it has been shown by Dolginov[1] and others[2,3] that in an allowed transition the investigation