similar experiments at different temperatures suggest that stability of the high density lipoprotein against ether extraction is strongly temperature dependent.

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BERKELEY, CALIFORNIA

COMMUNICATIONS TO THE EDITOR

HEAT OF FORMATION OF NITROGEN TRIFLUORIDE AND THE N-F BOND ENERGY

Sir:

The heats of reaction (1) and (2) have been determined using calorimetric procedures customary in our laboratory, and reasonably concordant values for the heat of formation of NF_3 have been

$$NF_3(g) + {}^3/_2 H_2(g) = {}^1/_2 N_2(g) + 3\,HF(aq,\ a = 1) \quad (1)$$

$$NF_3(g) + 4NH_3(g) = 3NH_4F(c) + N_2(g) \quad (2)$$

derived from the measurements.

For reaction (1) measured quantities of NF_3 and excess hydrogen over water were ignited in a bomb. No residual NF_3 was found in the products. ΔH^0_{25} for reaction (1) was determined by four experiments for which averages are shown in Table I as calculated on the basis of (a) NF_3 dosage and (b) HF titration. Uncertainties listed are standard deviations of the means.

Reaction (2), carried out by igniting a measured quantity of NF_3 mixed with excess ammonia, with no water, resulted in the formation of a crystalline deposit of NH_4F on the bomb walls. Eight experiments were performed. In Table I are shown values for ΔH^0_{25} calculated from (c) volume of NF_3, (d) weight of NF_3, (e) weight of NH_4F, (f) moles NH_3 determined by analysis of the NH_4F, and the mean of these weighted inversely as the squares of the standard deviations.

TABLE I

RESULTS OF CALORIMETRIC MEASUREMENTS

	Reaction	Basis of calculation	ΔH^0_{25} kj./mole	$\Delta Hf^0_{25}(NF_3)$ kcal./mole
(a)	(1)	NF_3	-845.6 ± 1.7	
(b)	(1)	HF	-871.9 ± 0.6	
	(1)	Mean	-859.0 ± 13.4	
			$(= -205.3 \pm 3.2$ kcal./mole)	-30.7 ± 3.4
(c)	(2)	NF_3 volume	-1084.1 ± 7.1	
(d)	(2)	NF_3 weight	-1081.1 ± 3.3	
(e)	(2)	NH_4F weight	-1087.0 ± 2.5	
(f)	(2)	NH_3 titration	-1098.7 ± 8.4	
	(2)	Mean	-1085.7 ± 4.2	
			$(= -259.5 \pm 1.0$ kcal./mole)	-29.4 ± 2.1
	(1 and 2)	Mean		-29.7 ± 1.8

The heat of formation of NF_3 is calculated from the measurements on reaction (1) using ΔH^0-$[HF(aq.,\ a = 1)] = -78.66$ kcal./mole.[1] It is calculated from the measurements on reaction (2) using $\Delta H_f[NH_3(g)] = -11{,}04$ kcal./mole[1] and $\Delta H_f[NH_4F(c)] = -111.0$ kcal./mole.[2] In the latter calculation, the principal uncertainty is in the heat of formation of NH_4F, which we estimate to be ± 0.6 kcal./mole. The weighted average of the results gives $\Delta H_{f25}[NF_3] = -29.7 \pm 1.8$ kcal./mole, and indicates that NF_3 is slightly more stable than was found by Ruff and Wallauer.[3,1]

With $E(F\text{-}F) = 37.7 \pm 1$ kcal./mole[4] and $E(N{\equiv}N) = 225.92 \pm 0.1$ kcal./mole,[5,1] the mean N–F bond energy $E(N\text{-}F)$ in the NF_3 molecule is 66.4 ± 0.8 kcal./mole. Following Reese and Dibeler[6] the dissociation energies of the individual bonds are estimated to be at 25°: $D(NF_2\text{-}F) = 74.0$; $D(NF\text{-}F) = 62.6$ $D(N\text{-}F) = 62.6$ kcal./mole.

[1] National Bureau of Standards Circular 500, 1952.

[2] T. L. Higgins, "Dissertation Abstracts," **17**, 1231 (1957).

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[6] R. M. Reese and V. H. Dibeler, *J. Chem. Phys.*, **24**, 1175 (1956).

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A MODEL FOR CELLULAR CATION DISCRIMINATION

Sir:

The preferential uptake of potassium (or rubidium) ions from solutions containing 20–30 times more sodium than potassium by cells is a fundamental fact of biology. However, no cationic discrimination system has been isolated from cells nor does any known chelating agent or ion exchange resin exhibit this degree of preference for potassium over sodium.[1] This note describes results with orthoclase, a silicate feldspar ($KAlSi_3O_8$) which shows properties of cationic selection, similar to that exhibited by living cells.

In the orthoclase lattice there is insufficient free space surrounding the potassium to accommodate a single water molecule in the structure.[2] When orthoclase particles[3] (20–80 mesh) are incubated with Rb^{86} or Na^{22} (added as the chloride) these cations are taken up from solution (esti-

[1] *Cf.* I. M. Glynn, *Progress in Biophysics*, **8**, 241 (1957).

[2] C. E. Marshall, "Colloid Chemistry of the Silicate Minerals," Academic Press, New York, N. Y., 1949, pp. 23–25.

[3] Silicate minerals, obtained from Wards Natural Science Establishment, N. Y., included orthoclase *var.* Adularia (Brimfield, Mass.), microcline (Ontario), and leucite (Rome); samples were crushed, sieved, and washed with water, ethanol, and ether.