the structural formulas assigned above were correct. The physical constants are presented in Table I, and the infrared spectra[2] are shown in Figs. 1 and 2. The infrared spectra for perfluoropropyl disulfide and trisulfide are almost identical and indicate the similarities in structure. The main difference is the presence of a band at 12.59 microns for the trisulfide, absent for the disulfide, which may be accounted for by the presence of the additional sulfur atom in the former. In comparing these spectra with that for 1-iodoheptafluoropropane,[3] the striking similarity of all spectra from 2 to 9 microns is excellent evidence for the presence of the C_3F_3- group in all three cases.

The chemical reactions of these perfluoro sulfur compounds are being studied.

Experimental

In a sealed Pyrex glass bulb of 500-ml. capacity, a mixture of 22.0 g. (0.0743 mole) of 1-iodoheptafluoropropane prepared as previously described[3] and 50 g. of elemental sulfur was carefully heated at 250° for 14 hours. Reaction was evidenced by the liberation of large amounts of free iodine. Traces of a gaseous product were noted when the Dry Ice cooled flask was unsealed. There was finally collected 8.9 g. of iodine and 12.78 g. of a liquid product by transferring under a vacuum of 0.5 mm. at temperatures up to 180°. Fractional distillation at 760 mm. pressure yielded several cuts: 0.5 g., b.p. 41–45° (unreacted C_3F_7I); 0.5 g., b.p. approximately 90° (probably $C_3F_7SC_3F_7$); 7.0 g., b.p. 120–123°, mostly 122.2°, ($C_3F_7S_2C_3F_7$); and 3.0 g., b.p. 152.5–153° ($C_3F_7S_3C_3F_7$). *Anal.*[4] Calcd. for $C_6F_{14}S_2$: C, 17.92; F, 66.14; mol. wt., 402.2. Found: C, 17.89; F, 66.18; mol. wt., 400.0. Calcd. for $C_6F_{14}S_3$: C, 16.59; F, 61.25; S, 22.15; mol. wt., 434.3. Found: C, 16.30; F, 61.30; S, 22.35; mol. wt., 434.2.

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(4) Microanalysis by Clark Microanalytical Laboratory, Urbana, Illinois. Molecular weights determined by Victor Meyer method.

RESEARCH INSTITUTE OF TEMPLE UNIVERSITY
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The Heat of Formation and Entropy of Aqueous Cuprous Ion

BY DONALD D. WAGMAN

The note by Hugus[1] has pointed out an error in the value of the entropy of aqueous cuprous ion in Table I–34 of the Selected Values of Chemical Thermodynamic Properties.[2] This value was calculated from the values for the heat and free energy of formation of the $Cu^+(aq)$ ion. In calculating the value of $\Delta H_f°$ we used the equilibrium data of Heinerth[3] on the reaction $^1/_2$ Cu (c) + $^1/_2Cu^{++}$ (aq) = Cu^+ (aq) measured as a function of temperature. However, the value ΔH = 9.4 kcal., calculated from the log K *vs.* $1/T$ plot, was erroneously assigned to the reaction Cu(c) + $Cu^{++}(aq)$ = $2Cu^+(aq)$. Utilizing the proper value of ΔH and the heat of formation of $Cu^{++}(aq)$ = 15.39 kcal./mole[2] (calculated from other data[4–7]) we obtain the following corrected values for the formation of $Cu^+(aq)$

$$Cu(c) + H^+(aq) = Cu^+(aq) + {}^1/_2H_2(g)$$
$$\Delta H_f°_{298.16} = 17.1 \text{ kcal./mole}$$
$$\Delta F_f°_{298.16} = 12.0 \text{ kcal./mole}^{8,9}$$
$$\Delta S°_{298.16} = 17.1 \text{ cal./deg. mole}$$

Taking the entropies of $H^+(aq)$, Cu(c), and $^1/_2H_2(g)$ as 0, 7.96, and 15.61 cal./deg. mole,[2] respectively, we obtain

$$S°(Cu^+(aq)) = 9.4 \text{ cal./deg. mole}$$

This value is in agreement with that of Hugus within the limits of uncertainty. The difference is due to the fact that we have assigned values to the heat and free energy of formation of the cupric ion $Cu^{++}(aq)$ slightly different from those used by Latimer, Pitzer and Smith in their calculation of the entropy of the ion.[10,11]

The values of $\Delta H_f°$ in Table I–34 for $Cu_2SO_4(aq)$ and $Cu(ClO_4)_2(aq)$ should also be changed to −181.4 and −47.4 kcal./mole, respectively.

We wish to thank Mr. Hugus for calling attention to this error.

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THERMOCHEMISTRY SECTION
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The Occurrence of Hydroxylysine in Proteins

BY LOIS WILEY INSKIP

Because of conflicting reports[1,2] in the literature on the occurrence of hydroxylysine in proteins, a search for hydroxylysine in the basic amino acid fractions of six protein hydrolysates was made by means of paper chromatography. Gelatin, known to contain about 1% hydroxylysine, was used as a control.

Two-dimensional chromatograms run in the phenol–collidine solvent system showed that hydroxylysine was present in gelatin, as was anticipated, but absent from casein, lactalbumin, glycinin and zein (gluten). Human hair contained a substance which moved on the chromatogram to a position very close to that occupied by hydroxylysine but which was probably cystine. Although cystine is usually decomposed during two-dimensional chromatography when phenol is used as the first solvent,[3] traces of it may be detected when it is

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