

THE SOLUBILITY OF 1,4-BUTANESULTONE IN WATER*

By M. A. JERMYN†

1,4-Butanesultone (4-hydroxy-1-butan Sulphonic acid sultone) has been described as immiscible with water.¹ However, certain experiments in this laboratory involving reactions of the sultone in aqueous media showed it to be moderately soluble in water. Determination of the mutual solubilities of the sultone (prepared according to ref.², m.p. 13–14°) and water over a range of temperatures, using the cloud-point technique and sealed tubes for temperatures above 80°, showed the two liquids to have an upper consolute temperature of 119° at a composition of 56% by weight (0.144 mole fraction) of 1,4-butanesultone. The consolute temperature is not attainable at atmospheric pressure, since the approximate boiling point at 760 mm of the two-phase mixture was found to be 103°.

TABLE I
MUTUAL SOLUBILITY OF WATER AND 1,4-BUTANESULTONE

Temp.	Aqueous Phase		Sultone Phase	
	Weight % of Sultone	Mole Fraction of Sultone	Weight % of Sultone	Mole Fraction of Sultone
0°	7.0	0.00986	freezes	
20	7.6	0.0108	98.1	0.872
40	10.4	0.0151	96.4	0.780
60	14.6	0.0221	93.5	0.656
80	23.5	0.0397	89.0	0.517
90*	29.7	0.0529	86.0	0.448
100*	36.5	0.0709	79.7	0.342
100*	45.5	0.0955	70.9	0.244
119*	56		0.144	

* Sealed tube data.

Table I shows the mutual solubilities at various temperatures read off from the graph of cloud-point against composition. Hydrolysis of the sultone, measured by acid formation, was not more than 0.1% in equal volumes of sultone and water held at 130° for 5 min. Even at the highest temperatures the errors in the quoted solubility data due to hydrolysis are therefore negligible. The degree of hydrolysis found is not incompatible with the data of Helberger and Lantermann¹ (complete hydrolysis in 90 min at 100°) since they studied dilute aqueous solutions.

* Manuscript received May 19, 1966.

† Division of Protein Chemistry, CSIRO Wool Research Laboratories, Parkville, Vic.

¹ Helberger, J. H., and Lantermann, H., *Liebigs Ann.*, 1954, **586**, 147.

² Snoddy, A. O., *Org. Synth.*, 1963, Coll. Vol. IV, 529.