

resolution of α -bromobutyric acid. The author failed to accomplish resolution by means of the brucine salt, but by means of the strychnine salt obtained a value for the maximum rotation lower than ours and of opposite sign, namely, $[\text{M}]_D^{25} - 54.0^\circ$.

It is interesting to note that through the strychnine salts both acids lead to active acids rotating in the same direction.

It may also be mentioned that α -bromobutyric acid had previously been resolved by Levene, Mori and Mikeska [*J. Biol. Chem.*, **75**, 337 (1927)] to a degree somewhat higher than that of Ahlberg.

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THE ROTATION OF MOLECULES OR GROUPS IN CRYSTALLINE SOLIDS

Sir:

In continuation of earlier studies of the possibility of rotation of molecules or groups in crystalline solids [Smyth and Hitchcock, *THIS JOURNAL*, **54**, 4631 (1932); *ibid.*, **55**, in press (1933); Kamerling and Smyth, *ibid.*, **55**, 462 (1933)], the dielectric constants of hydrogen sulfide, ammonia and methyl alcohol have been measured from -190° to a few degrees above the melting points over a frequency range of 300 to 60,000 cycles. In solid hydrogen sulfide two sharp transitions are shown by the dielectric constant at -146.7° and -170.0° , in excellent agreement with the values just reported by Kemp and Denison [*THIS JOURNAL*, **55**, 251 (1933)]. The dielectric constant of the solid, higher than that of the liquid, shows almost free molecular rotation above the lower transition. Below it, there appears to be practically no dipole rotation. The behavior of hydrogen sulfide is thus similar to that of the hydrogen halides and in marked contrast to that of ice.

The low dielectric constant of solid ammonia in contrast to the high value of the liquid and its small decrease with decreasing temperature show that the molecule behaves like large molecules, such as those of nitrobenzene, in possessing little or no rotation in the solid, thus differing from all the small molecules previously investigated by means of dielectric constants. The dielectric constant of solid methyl alcohol near the melting point is much lower than that of the liquid but high enough to give evidence of some dipole rotation, which decreases sharply at a transition point -114.0° , a value close to the average of those found from specific heat measurements, -115.7° by Kelley [*THIS JOURNAL*, **51**, 180 (1929)], and -112.0° by Parks [*ibid.*, **47**, 338 (1925)]. Under conditions such that a glass is probably formed, a change of dielectric constant with frequency is found. Higher alcohols are being investigated in order to learn whether

the dipole rotation is a limited rotation of the entire molecule or merely of the hydroxyl group.

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THE ACTION OF BROMINE AND BUTADIENE

Sir:

Dr. H. Eyring has presented calculations in a paper given before the Section of Chemistry of the American Association for the Advancement of Science which indicated that addition of bromine to butadiene should be 1-4 rather than 1-2. The high energy of activation also indicated that the reaction should not occur in the gas phase. At the request of Doctors Taylor and Eyring, experiments have been made which show that on mixing gaseous butadiene and bromine in the ratio of 1-1 or 1-0.5 with from 15-20 volumes of nitrogen a reaction occurs and that crystals of the 1,4-dibromo-2-butene are formed. The melting point of the unpurified crystals was 53° (very sharp), which is identical with that reported in the literature. A mixture of the product with 1,2,3,4-tetrabromobutane melted from 30 to 48°. On carrying out the reaction in the same bulb which had been previously coated with paraffin, the rate of the reaction was very markedly reduced. This fact together with the observation that no fog or smoke formed in the uncoated reaction sphere leads to the conclusion that the reaction occurs on the surface. The kinetics of the reaction on glass and surfaces are being studied and details of the experiments will be reported later.

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THE ISOTOPE OF HYDROGEN

Sir:

With the aid of Dr. R. T. Macdonald I have been attempting to isolate various isotopes. Less than a month ago we turned our attention to the isotope of hydrogen. Our first experiments, employing a difference in overvoltage suggested by the work of Washburn and Urey, were so promising that we at once planned a systematic series of concentrations which has just been completed. This yielded water of specific gravity 1.035, which means that the heavy isotope constitutes one-third of all the water