tion of pentyne-2 (b. p. 55.9 ± 0.05° at 760 mm., $n^{20}_D$ 1.4040, $d^{20}_4$ 0.7115) were hydrogenated in an alcohol-water solution in the presence of colloidal palladium. Slightly less than the theoretical quantity of hydrogen was used. The pentene with alcohol distilled from the mixture through a Vigreux column at 34–36°. The hydrocarbon (78.5% yield) freed from alcohol had a refractive index $n^{20}_D$ 1.3824. One fractionation through Fenske column A gave (1) 5% boiling at 36.8–37.0° and (2) 90% boiling at 37.0 ± 0.05°; the refractive indices of these fractions were, respectively, $n^{20}_D$ 1.3824 and 1.3822, that of the residue was $n^{20}_D$ 1.3840. In a second fractionation of (2) the entire distillate (98%) boiled constantly at 37.0 ± 0.05°, had a refractive index $n^{20}_D$ 1.3822 and a density $d^{20}_4$ 0.6562. The refractive index of the residue was $n^{20}_D$ 1.3826.

THE CHEMICAL LABORATORY OF
MOUNT HOLYOKE COLLEGE
SOUTH HADLEY, MASS. RECEIVED AUGUST 1, 1938

## The Specific Heat of "Lucite" (Methyl Methacrylate Polymer)

BY FRANK T. GUCKER, JR., AND WILLIAM L. FORD

We have found the polymerized methyl methacrylate plastic now made by the du Pont Company under the trade name of "Lucite" a useful insulating material in our calorimetric work. Many of its physical properties have been tabulated.[1] For our purposes, the specific heat was important and, since we could not find it listed, we determined it as follows.

Fifteen disks each 3 mm. thick were cut from a Lucite rod, $^3/_8$ inch (9 mm.) in diameter. A small hole was drilled in the center of each. The disks were then threaded on pieces of fine copper wire and suspended from the thermel tubes in one calorimeter of the apparatus developed in this Laboratory[2] for measuring heat capacities of aqueous solutions. The disks were spaced apart to allow free circulation of water, with which the calorimeter was filled to the standard height. The resistance ratio required to balance this calorimeter against the tare was then measured in the usual way, with an accuracy of about 0.01%. The heat capacity of the Lucite was calculated from this ratio and the known heat capacities of the water, the calorimeter and the copper wire. Since the heat capacity of the 3 g. of Lucite was only about 0.3% of that of the whole system, the uncertainty in its value is about 3%. The results of two independent experiments actually agreed somewhat better than that, yielding 0.342 and 0.344, and we may take as the probable value of the specific heat 0.343 (±0.005) cal. deg.$^{-1}$ g.$^{-1}$.

Although its specific heat is larger than that of Pyrex glass, its density is only half as great, and the heat capacity *per unit volume* is only 82% of that of glass. This factor, in combination with a thermal conductance less than half that of glass, equal transparency, great mechanical strength and easy machining, makes Lucite a useful substitute for glass as an insulating material in calorimetric work.

(1) "Methacrylate Resins," *Ind. Eng. Chem.*, **28**, 1160 (1936).

(2) Gucker, Ayres and Rubin, THIS JOURNAL, **58**, 2118 (1936).

CHEMICAL LABORATORY
NORTHWESTERN UNIVERSITY
EVANSTON, ILLINOIS RECEIVED JULY 5, 1938

## The Methylation of Sugars

BY B. CLIFFORD HENDRICKS AND ROBERT E. RUNDLE

The importance of fully methylated sugars as reference compounds in carbohydrate chemistry has led to many attempts to find more satisfactory methods for their synthesis. Irvine and Purdie[1,2] used methyl iodide and silver oxide in their preparation. A more generally used method[3] is that of Haworth in which dimethyl sulfate and sodium hydroxide are the reagents used. More recently West and Holden[4] have modified the method of Haworth by using carbon tetrachloride as a solvent, a more concentrated alkali and a different method of hexoside hydrolysis to obtain the free methylated sugar.

The authors found that the concentrated alkali, used by West and Holden for the last step in the methylation, produced sugar decomposition. Their first steps, however, were satisfactory for partial methylation.

Muskat[5] has shown that methylation may be accomplished by using free alkali metal and methyl iodide on a hexoside in liquid ammonia. He used potassium which is expensive and prepared only small amounts of the sugars. If sodium metal is substituted for the potassium the cost is reduced but for larger quantities of reactants the insolubility of the tetrasodium salts

(1) Irvine and Purdie, *J. Chem. Soc.*, **83**, 1021 (1903).

(2) Irvine and Purdie, *ibid.*, **85**, 1052 (1904).

(3) Haworth, *ibid.*, **107**, 11 (1915).

(4) West and Holden, THIS JOURNAL, **56**, 930 (1934).

(5) Muskat, *ibid.*, **56**, 695 (1934).