

ART. XV.—*The Heat of Combination of Acidic Oxides with Sodium Oxide, and the Heat of Oxidation of Chromium*; by W. G. MIXTER.

[Contributions from the Sheffield Chemical Laboratory of Yale Univ.]

It is the purpose of the writer to accumulate data on the heat effect of the union of acidic oxides with sodium oxide, and to determine if the position in the Periodic System and the magnitude of the atomic weight of an element have a marked influence on this heat effect. Much has been accomplished by Thomsen, Berthelot and others who have derived the heat of formation of salts from the observed heat of neutralization in solution—a method not applicable in all cases to salts which hydrolyse largely. The reaction with sodium peroxide avoids errors due to hydrolysis and gives fairly accurate results, as shown in a previous paper* in which $2\text{Na}_2\text{O}_2, \text{C}_2 = 133500^\circ$ was the observed heat and 132500° that derived from Thomsen's data. As a test of the method two determinations were made and in each rather more than two grams of rhombic sulphur were burned in a bomb with an excess of sodium peroxide. The heat effect for one gram was 5275° and 5267° respectively; mean 5271° and for 32 grams of sulphur, 168670° . The heat effect of $\text{Na}_2\text{O}, \text{SO}_3$ is derived thus:—

$3\text{Na}_2\text{O}_2, \text{S}$	=	168700°
$3\text{Na}_2\text{O}, 3\text{O}$	=	58200°
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$\text{Na}_2\text{O}, \text{S}, 3\text{O}$	=	226900°
$\text{S}, 3\text{O}$	=	103200°†
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$\text{Na}_2\text{O}, \text{SO}_3$	=	123700°

From Thomsen's data we have

$2\text{Na}, \text{S}, 4\text{O}$	=	328590°
$2\text{Na}, \text{O}$	=	99760°‡
$\text{S}, 3\text{O}$	=	103200°
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$\text{Na}_2\text{O}, \text{SO}_3$	=	125630°

Thomsen used Bekétoff's result for $2\text{Na}, \text{O}$; deForcrand§ considers it too high and that 91000° is probably more accurate. The calculated heat effect of $\text{Na}_2\text{O}, \text{SO}_3$ will not be changed by using this number.

S. W. Parr|| mentioned that oxygen is sometimes liberated in combustion with sodium peroxide and the writer has found

* This Journal, xxiv, 134.

† Thomsen, *Thermochemische Untersuchungen*, ii, 254.

‡ *Ibid.*, iii, 232. § C. R., cxxvii, 1449.

|| J. Am. Chem. Soc., xxix, 1606.