

that on explosion with less than its own volume of oxygen, no steam formation (indicative of the thermal decomposition of monohydroxy-acetylene) can be observed. In such circumstances, half the acetylene is burnt through  $C_2H_2O_2$  to  $2CO + H_2$ , the other half being resolved by the heat into its elements together with a small amount of methane. I therefore agree that, in the combustion of acetylene, unlike that of ethylene and of other hydrocarbons, so far there is no evidence of a primary monohydroxy-stage, the initial stage apparently involving the direct formation of an oxygenated  $C_2H_2O_2$  molecule. WILLIAM A. BONE.

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#### High Temperature Allotropes of Manganese.

IN a communication entitled "A High-Temperature Modification of Manganese" (NATURE, Aug. 31, 1929) Messrs. Persson and Öhman confirmed, by means of the X-ray examination of the lattice struc-

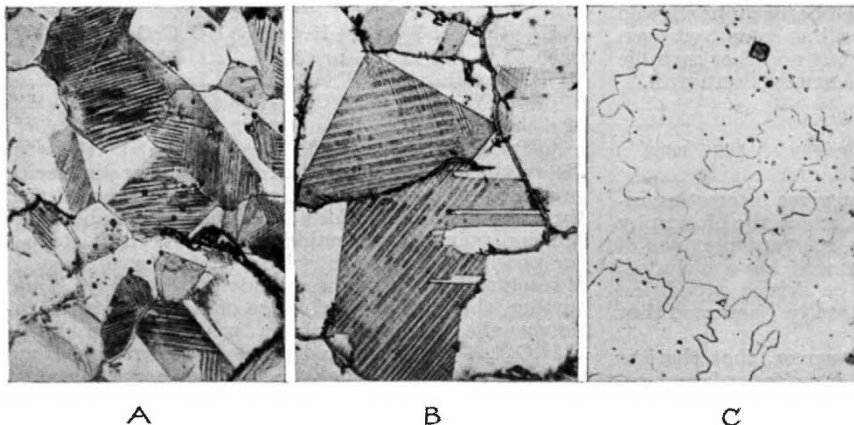


FIG. 1.—Microstructure of manganese after heat treatment at various temperatures and quenching in water.  $\times 100$ . A, 2 hours at  $975^\circ C$ .; B, 2 hours at  $1075^\circ C$ .; C, 2 hours at  $1220^\circ C$ .

ture of a series of copper-manganese alloys, the existence of the allotropic transformation of manganese which I had previously found to take place at  $1191^\circ \pm 3^\circ C$ . and showed that its structure corresponded with that of the tetragonal modification, as determined by Westgren, of manganese obtained by electrolysis. They also found that the critical point  $1024^\circ \pm 3^\circ C$ ., on the other hand, did not seem to be accompanied by any change of crystal structure.

Shortly after the publication of my researches on manganese (*Jour. Iron and Steel Inst.*, 115, 393; 1927) I carried out further experiments regarding the microstructure of the high temperature allotropes, and in view of Messrs. Persson and Öhman's results they may be of interest. Fig. 1 A and B show the microstructures of a sample of manganese which has been heat-treated in hydrogen for 2 hours at  $975^\circ C$ . and  $1075^\circ C$ . respectively and then quenched in water. It is evident on comparing these structures that no change in crystal structure has occurred on passing through the  $1024^\circ C$ . transformation point—which supports the view held by the above authors. Fig. 1 C shows the structure of the same sample of manganese which has been heat-treated in hydrogen for two hours at  $1220^\circ C$ . and then quenched in water; a change in structure has obviously occurred.

Messrs. Persson and Öhman suggest that, since  $\gamma$ -manganese, *i.e.* electrolytic manganese, is in reality a high temperature modification, that is sufficient to account for its rapid transformation into  $\alpha$ -manganese by heating to  $150^\circ C$ . This also accounts

for the fact that no thermal change was observed by me in pure manganese, prepared by distillation *in vacuo*, over ranges of temperature from  $30^\circ$  to  $300^\circ C$ .

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#### The Charge of an Electron.

LAST January I proposed a theory of electric charge which led to a definite prediction of the numerical value of the constant  $hc/2\pi e^2$ . Since then I have been trying to obtain fuller insight into the more obscure parts of the theory—places where it was necessary to trust to a sense of analytical form rather than to any definite conception of the physical or geometrical meaning of the formulæ. I think that I have now been able to bring the theory into an improved form.

I hope to publish the full investigation soon; meanwhile I may state a result of general interest. According to the new calculation the value of  $hc/2\pi e^2$  is 137. It is difficult to explain briefly the change from the former result (136); but, broadly speaking, it is due to the recognition that the 'rotation', which I introduced to represent interchange of the two electrons, is not one of the 136 symmetrical rotations of a pair of electrons, but is an antisymmetrical rotation which must be counted in addition. This was not very apparent so long as the rotation term was introduced solely as a consequence of the Fermi-Dirac principle; but the present theory goes more deeply into the origin of the term and makes clear its relation to the symmetrical rotations.

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#### Forestry Research in India.

IN connexion with the article on the above subject which appeared in NATURE of Nov. 16, I should like to explain that the words "Towards the end of 1900 the first research work by the Forest Department was commenced, when a member of the forest staff was appointed", referred to the fact that this was the first whole-time appointment made with the object of undertaking a definite line of research. Executive officers of the Department had been engaged upon research work before (and after) 1900 in addition to their own duties, as exemplified by the valuable work done by the late Sir D. Brandis, J. S. Gamble, and many others. When the Research Institute was incorporated in 1906, all the research officers were drawn from the gazetted ranks of the Department.

In view of the lamented death of Sir Sainthill Eardley-Wilmot, only a few days after the opening of the new research buildings at Dehra Dun, it may be added that, next to Lord Curzon, the officer most responsible for the new scheme was Eardley-Wilmot, at the time Inspector-General of Forests to the Government of India; for it was due to his vision and enthusiasm that the Research Institute came into being.

THE WRITER OF THE ARTICLE.