electron microscopic observation reveals this to lesser degree, probably due to inadequate dispersion of particles in the specimen) and halved the sedimentation volume, while the surface area or the mean particle diameter remained almost the same. This clearly shows that the pressing could almost completely disintegrate the secondary and tertiary particles to the primary particles but produce no fresh surface by deforming or crushing the primary particles themselves.

The metallurgical importance seems, therefore, to lie rather in the size distribution of the primary particles as revealed by the powder subjected to pressing than in the distribution of the original powder.

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## 20. On the Precipitates of Tungstic Acid

*Nobuji Sasaki* and *Ryuzo Ueda*

(Sasaki Laboratory)

The precipitates of tungstic acid produced by adding sodium tungstate solution to hydrochloric acid were observed with an electron microscope and dehydration curves of these precipitates were obtained by the use of a quartz-fibre spring balance.

(1) A turbid solution obtained by adding 0.5 ml of 0.1 molar sodium tungstate solution to 10 ml of 0.05 molar hydrochloric acid at room temperature, contained on centrifugifying the precipitate (a) consist of thin crystals of various forms, round, semi-elliptical, square, boat-like and needle-like (0.2–2$\mu$). These crystals, if left in solution, slowly form aggregates which hardly disperse on addition of water. The supernatant solution contained fine needles (0.1$\mu$) and small granules (0.2$\mu$) which on standing assumed respectively the form of network and threads.

(2) The precipitate (b) produced by pouring sodium tungstate solution into hot hydrochloric acid consists of very fine angular plates (0.05$\mu$).

(3) The dehydration curves are continuous with precipitate (a) and dicontinuous with precipitate (b) whose composition is $WO_3 \cdot H_2O$ at 85–185°C.

(4) Strong electron beam or heating decomposes thin crystals of tungstic acid to small granules randomly scattered within their orignal forms.

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## 21. Influence of Slag, especially of $Al_2O_3$ and $TiO_2$ in Slag upon the Structure and Mechanical Properties of Cast Iron. (V)

*Hiroshi Sawamura* and *Masatoshi Tsuda*

(Sawamura Laboratory)

The gray cast iron was melted under the slag of $SiO_2$–$CaO$–$Al_2O_3$–$TiO_2$ system

($TiO_2$: about 9%) at 1400°C., and cooled in various ways respectively as follows:

A) Cooled in air.

B) Quenched in water.

C) Cooled in air after being cooled to 1150°C. from 1400°C. in furnace.

D) Quenched in water after being cooled to 1150°C. from 1400°C. in furnace.

E) Cooled to room temperature from 500°C. in furnace.

Melting duration of time was 15 minutes at 1400°C., and the other eyperimental conditions were the same as Report 4 (Bulletin of the Institute for Chemical Research, Kyoto University. vol. 23. Dec., 1950).

Titanium content in gray iron was increased to about three or four times of the original content in each experiments. The distribution, form and size of graphite in gray iron was studied microscopically and the size of graphite was classified by the methods after the A.S.T.M. Designation.

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# 22. A Study on the Moulding Sand for Green Sand Castings. (I)

*Shiro Morita* and *Akira Ono*

(Sawamura Laboratory)

Four kinds of new sands for green sand castings and four kinds of old sands, used at four different foundries in Kyoto Prefecture, were tested. The object of this study is to clarify the nature of the moulding sand by means of the scientific methods of analysis of the moulding sands which have been experientially convinced by various foundrymen as the most favourable sand for green sand castings.

These analytical methods involve the chemical analysis, and determination of grain distributions, permeability, hardness, and compressive strength, but the chemical analyses were carried out regarding only the new sands.

The grain distributions and clay contents of those sands are shown in Table I. A, B, C and D denote four foundries. From these results, it is clarified that the most favourable sands used daily by different foundries have the approximately equal clay contents (about 10%) and grain distributions (about 50% between 48 and 150 mesh), regardless of the differences among four new sands. A is a copper alloy foundry and B, C and D are cast iron foundries of light and medium size castings. It should be due to the very small grain fineness that the clay content of the old sand A is very low. The same phenomena are observed on other various properties of these sands.