Further Study of the Influence of Some Carbon Particles in Graphite Manufacture

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Abstracts. The influence of properties of carbon particles in graphite manufacture was studied with different carbon particle forms, such as: 1) Shape & porosity of carbon grain & grist particle-size distribution; 2) The influential factors of interaction between carbon grain & binder; 3) Carbon grain on mixing process; 4) Different composition of carbon grain.

Introduction

The nature of bulk body of composite carbon grains has not been fully depend on their molecular or crystal-phase. Properties of carbon body such as: strength, elasticity, density, hardness and heat conductivity are distinguishes with the size of grain, porosity, shape, surface nature and bulk density.

The feature of this composition is:

- On account of the inter-combination or inter-connection of grain that the inner space has been produced.
- Depend on the increase both of the grain dispersiveness and surface area, the surface phenomena will be changing the reaction velocity, inner fraction and interconnect of grain and so on.
- The greatest section of unequal axial grain will be doing verticle outer action force and changed into anisotropy of bulk body.

In general, the bulk porosity of the carbon grist used making carbon bodies is an important property since it affects the amount of binder needed, which in turn influence the final fired body. The particle-size distribution of the grist & particle shape is well known as one factor controlling the porosity, Fig. 1.

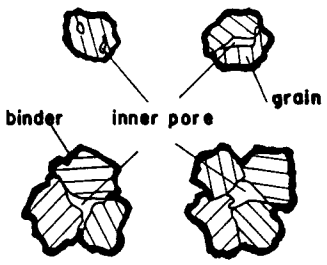

Figure 1. Inner pore of grain

Influential Factor of The Properties of Carbon Grain

It could be attributed to formation of different type of carbon shape, surface manner and hole size as a result of the difference of carbon's original condition.

Shape of Carbon Grain

Three methods of fracturing could be distinguished: (base of coke)

- Isotropic;
- Asymmetric;
- Irregular.

It was established that the manner in which fracturing of the coke proceeds does not depend on differences in the volatile matter content;

Substances most readily graphitized would be expected to have their grains more elongated;

Petroleum coke and the cokes from pyrolysis of hydrocarbon vapours are known to be most easily graphitized, while pitch coke is rather less suitable for the purpose;

Pitch coke is found to have the highest asymmetry, although its anisotropy is very indistinct. It is a indication that the shape of grains does not depend on the microstructure of the material coked;

The pyrolytic cokes appeared to be chiefly isotropic and are not only completely compact, but also they do not show any shrinkage in the manufacturing process;

Variations with size are found: In general, the type of grinder is not important, but are dependent on the type of coke, particularly its fissure structure.

Porosity

Some important shape of carbon gap are described:

- Molecular-gap;
- Ultra-gap;
- Coarse-gap (1000Å size in passage);
- Transition-gap (about 100-400Å size in width).

Influential Factors of Interaction Between Carbon Grain & Binder

Coking Value

The reason of large bulk surface in creased coking value is:

- Active surface energy
  The remainder valence forces which are holding in surface atoms of grain, supply compact condition between grain & binder molecular, thus remains of carbon atoms are increased.
- Adsorption of surface grain are grown by active molecular (exam. O_2, CO_2 etc.).

Relation Between Surface Manner & Bulk Surface

In general, it is closely related between surface manner and bulk surface, but there is differences in their nature. Surface manner of carbon grains are indicated by coarse, porosity and properties of structure. It is strongly compact with binder when the coarseness and pore-size distribution increased. Binder, that encircling few thickness on grain, mixed with adsorbed O_2 or CO_2 of original grain, will have been grown coking value on the temp. of 300-450 °C (oxidization of pitch).

Influential Factors of Carbon Grain on Mixing Process

Proportion Between Grain Size and The Fraction

Fig. 2 is a form of expression.

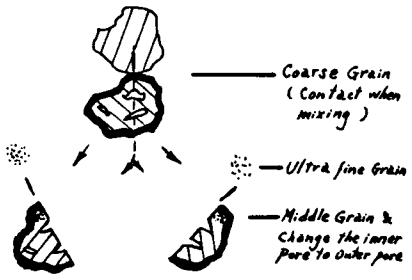

Figure 2. Defect of unharmonious binder

Finely Subdivided Carbon Grain

Homogeneity of grain have shown some improvement while increasing dispersivity of it, but it leads to defect structure for finely grinded. It also was found that the effects of catalytic graphitization by outside metallic atoms when finely grinding.

Medium of Mixing

On account of the factor of friction and

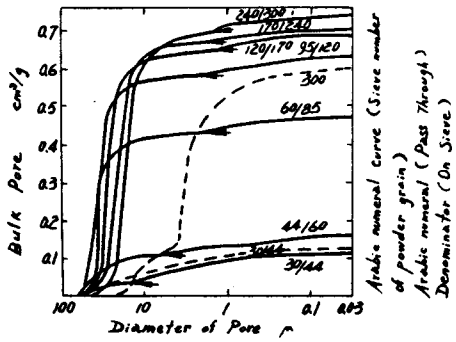

Figure 3. Diagram of differential petroleum coke fraction and distribution size of pore

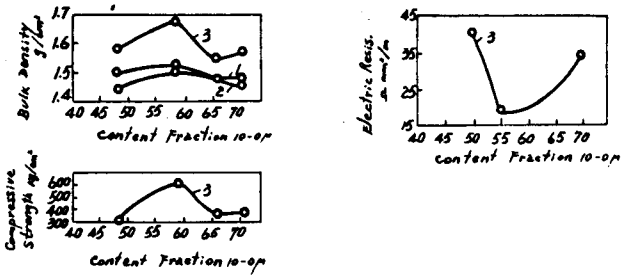

Figure 4. Influence of dispersed coke powder on properties of coke-carbon black fraction
1—Pressed 2—Baked 3—Graphitized

thermoelectric effect could be brought static electricity while the finely grain powder working in mixing process. So that the electrostatic grain easily producing concentrated phenomenon.

Difference on Real Density of Powder

While the difference on real density of powder in mixing, to produce light up & weight down. Especially, harmonious mixture separate phenomenon have taken place when vibration.

Influential Factors of Different Compound of Carbon Grain

From the singer phase of petroleum fraction & different size of grain (Fig. 3) to learn: When the grain become to fine that the bulk porosity of carbon body are increased and the size of pore become infinitely small. Hence, it will be producing distinct great change in polyphase of carbon compound with fine grain fraction.

Electrocarbon body made with 70-90% -325 mesh of powder is equal to -42 μ of size and does not to control the grain grade under -42 μ usually. Thus, dispersivity of grain have taken place greatest undulation and to influence the different nature on electrocarbon bodies. Fig. 4 to show the composition of coke-carbon black in the 10-0 μ grain grade and to get the different nature of electric resistance, density and compressive strength.

Reference

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2. Lin Ding Hao, 16th Biennial Conf. on Carbon, pp. 124, 1983.