FLUORINATION OF TREATED CARBON

Y. Kita * and N. Watanabe
Kyoto University, Kyoto 606 Japan

Graphite fluoride is classified into $(C_2F)n$ and $(CF)n$ types from the structure and composition. Both compounds have such unique physicochemical properties as low surface energy, solid lubricating characteristics, and oxidizing ability. However, a long reaction time is required to completely fluorinate graphite and moreover, the decomposition reaction of the product causes the lowering of the yields.

In this paper, the effect of the pretreatments of the starting material on the fluorination will be reported on the following methods.

1) Fluorination of Exfoliated Graphite Obtained by Heat-treatment of Graphite Lamellar Compound.

The exfoliated graphite was obtained by the immersion of graphite into the mixed solution of sulfuric acid and hydrogen peroxide and subsequent heat-treatment. It has both much large surface area and larger lattice strain than that of the original graphite.

The exfoliated graphite was much faster fluorinated than the original graphite. The dissociation of fluorine molecules to atoms was found to be a rate-determining step in the formation of graphite fluoride from the exfoliated graphite, whereas the process of diffusion of fluorine molecules was the rate-determining step in the fluorination of the original graphite.

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* Present Address : Central Glass Co. Ltd., Ube 755 Japan

2) Fluorination of Residual Carbon Formed upon Pyrolysis of Graphite Fluoride.

Graphite fluoride decomposes to carbon and some perfluorocarbons of low molecular weight at high temperature above 600 °C. The residual carbon was amorphous in analogy with petroleum coke or carbon black, but had smaller interlayer spacing and larger specific surface area due to its microporous structure than these amorphous carbons

The rate of the direct fluorination of residual carbon at a room temperature was comparable to that of active carbon, and the graphite fluoride obtained from the residual carbon has a similar high thermostability to that of graphite fluoride obtained from graphite at a high temperature under an atmosphere of fluorine gas. Upon direct fluorination of the residual carbon a more crystalline graphite fluoride was obtained even at a low temperature than the case of petroleum coke and carbon black. It is interesting that the fluorination of the residual carbon leads to the formation of crystalline graphite fluoride in high yield.