

## Sintering Parameters of Graphite Bulk Investigated by Synchrotron X-ray Techniques

Shi-Wei Chen (陳世偉)<sup>1\*</sup>, Chan-Sheng Wu (吳展昇)<sup>1</sup>, Shin-An Chen (陳興安)<sup>1</sup>, Chun-Chieh Wang (王俊杰)<sup>1</sup>, Chun-Han Lin (林君翰)<sup>2</sup>, Hsin-Ping Chang(張信評)<sup>2</sup>

<sup>1</sup> National Synchrotron Radiation Research Center, 101 Hsin-Ann Road, Hsinchu Science Park, Hsinchu, Taiwan

<sup>2</sup> National Chung-Shan Institute of Science & Technology, Material & Electro-Optics Division, Taoyuan, Taiwan

[chen.sw@nsrrc.org.tw](mailto:chen.sw@nsrrc.org.tw)

### Abstract

Graphite bulk with a really big size is widely used in kinds of fields, for example pantographs in the railway industry, graphite crucibles in the metallurgy, and et. al.. While, a relative technique to fabricate a graphite bulk is deficient in Taiwan. One thus need to purchase graphite bulks from the specific companies in Japan or Germany. That hinders the autonomy of industries in Taiwan. This study thus investigates the variation of composition, as well as morphology, in a graphite bulk before and after sintering process. As indicated, impurities containing oxygen and sulphur play an essential role in the densification reaction as sintering. With impurities, the relaxation of thermal stress is heterogeneous in the matrix, that causes cracking of graphite bulk. To produce a big-size graphite bulk, it is necessary to remove impurities before or during sintering process. The method can be introduced by the analyses of DSC and TGA that reflect endothermic/exothermic reactions and weight loss varied with heating temperature. When we keep material at the specific temperature for a very long time, impurities can be removed along with the dissipation of the beta phase. Results thus indicate the possibility to control impurities in a graphite bulk and avoid cracking. Accordingly, a suitable sintering parameter can be defined. This study providing fundamental knowledge about sintering process can become a basic to produce a big-size graphite bulk.

**Keywords** –*graphite bulk, sintering parameter, x-ray microscopy, x-ray absorption*