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A Study on the Carbon Contamination of Spark Plasma Sintered Body using Graphite Die

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Many research works on SPS (Spark-Plasma Sintering) reported that remarkable improvements in material properties can be obtained by this processing. It is because a consolidation at lower temperature for shorter period is possible in comparison with other conventional sintering methods. The reported material systems involve most of hard-to-sinter materials such as intermetallic compounds and refractory, high-performance engineering ceramics and their composites.

SPS is similar to a conventional electric-current sintering or hot-pressing. But it is different from them in the sense that the electric current is applied to a specimen in a form of pulse and the specimen is heated both by resistance heating of the specimen itself and the conductive die mold such as graphite. It is believed that graphite die mold and punch can contaminate the powder compact. But a precise measurement was not known for us.

In this study the carbon contamination from graphite die to sintered powder compacts was investigated using Fe and alumina. Die wall was covered with carbon paper, BN spray or BN slurry paint. Carbon content from the surface to the center of powder compact was determined by EPMA. A way to reduce the carbon contamination was discussed based on the results.

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