

32-46 Explosive compaction of Nd-Fe-B powder

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The explosive compaction technique has been applied to consolidate Nd-Fe-B amorphous powder, and the microstructure and magnetic properties of the compacts have been investigated. Explosive compaction was performed using an improved direct method. Nd-Fe-B amorphous powder was filled in the upper part of a metal sleeve and SiC powder was filled up to a lower part of the powder to suppress a reflection of the shock wave. This sleeve was set at the center of a steel base and shock consolidation was carried out using plastic explosive (SEP) which was set at the top of the amorphous powder. Highly dense compact ($>95\%$ relative density) without cracks was obtained by this technique under an optimum condition. A very thin melted layer was observed at the interface of powder particles. The magnetic properties of the compact are $B_r=8.5$ kG, $H_c=9.7$ kOe, $(BH)_{\max}=13.2$ MOe, and these values are same as those before shock consolidation. Transmission electron microscopy observation reveals that small $Nd_2Fe_{14}B$ particles exist inside the powder particle. These results indicate that the microstructure of the original powder is kept after explosive compaction. Since the microstructure inside grain was not changed even after shock consolidation, such excellent magnetic properties were obtained.

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