

Abstract Masato Sagawa:

### **The ultimate production technology of Nd-F-B sintered magnets**

Nd-Fe-B sintered magnets are used in motors and generators as thin plates. Typical process for producing the thin plates of Nd-Fe-B sintered magnets is strip- casting, milling, pressing, sintering, annealing and slicing. In this process, sintered bodies are always large blocks and slicing step is necessary to produce thin plates. A new process has been proposed to produce the thin plates of the Nd-Fe-B sintered magnets directly without slicing the blocks<sup>1</sup>. In this process, the alloy powder is filled into shallow cavities of graphite molds without pressing and the sintering is performed by transferring the molds filled with the alloy powder into a sintering furnace. This process is called pressless process or PLP for short. Advantages of PLP are firstly, direct production of thin plates of magnets, and secondary, the capability of using fine powder with minimizing oxidation no matter how fine the alloy powder is, which enables production of magnets with higher coercivity than the magnets produced by the process with the pressing step. Disadvantages of PLP are firstly, the necessity of preparing very large number of molds in mass production, and secondary, the number of shallow cavities made in a mold is small. We have developed a new technology in which the alloy powder is filled into a mold with 50 cavities separated by thin spacers, alignment of the powder filled in the molds is made by applying pulsed magnetic fields in a long coil, the mold is removed from the 50 powder compacts separated with spacers, and the 50 powder compacts separated with spacers are transferred into sintering furnace, leaving the mold outside the furnace. We call this technology new PLP because no pressing machine is used like in the conventional PLP explained above. The New PLP is the ultimate production technology because it realizes ultimately high productivity of compaction and alignment of the alloy powder, reduces drastically the number of molds necessary for mass production keeping all the advantages that the conventional PLP has. We have built automated equipment of new PLP and confirmed the performance of it; it enables mass production of the Nd-Fe-B sintered magnets with ultimately high magnetic properties, with ultimately high productivity and with ultimately high homogeneity of the magnetic properties.

<sup>1</sup> M. Sagawa, Y. Une, A new process for producing Nd-Fe-B sintered magnets with small grain size, Proc.20th Workshop on REPM, Crete, 2008, p.103