A New 8-Pole Alignment Ring-Shaped Nd-Fe-B Sintered Magnet for High Power Motor

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In the design of Brushless DC motor, permanent magnets (PMs) with high energy density, such as Nd-Fe-B, are essential to have high power to volume ratio. Among the Nd-Fe-B PMs, plastic PMs, made by injection molding process of the mixture of Nd-Fe-B powder and binders, are widely being used mainly for low power applications. However, for higher power applications, sintered Nd-Fe-B PMs having higher energy density than the plastic ones, are more attractive. In the viewpoint of the motor design, the polar anisotropic sintered Nd-Fe-B PM is expected to give stronger magnetic field, and therefore a PM motor with higher powder density is expected to be designed. However, the polar anisotropic sintered R-Fe-B PM, where R represents rare-earth metals, as well as Nd-Fe-B sintered PM, is often noted but rarely studied because of their difficulties of the powder aligning system construction. etc.

In order to apply strong static magnetic field to the anisotropic Nd-Fe-B magnetic powders, a powder-aligning-fixture is designed employing a pulse current electromagnetic system.

In this paper, the magnetic properties under various aligning fields are experimentally measured and a powder-aligning-fixture for a 8-pole alignment ring-shaped Nd-Fe-B sintered PM is optimally designed. Finally, an anisotropic Nd-Fe-B PM is realized by using the optimally designed powder-aligning-fixture.

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