PROTERIAL

News Release

July 24, 2023
Proterial, Ltd.

Output exceeding 100 kW applicable for traction motors for BEVs and PHEVs verified on actual ferrite magnet motor

Proterial, Ltd. (hereinafter referred to as "Proterial") announced in December 2022 that it has verified, in simulations, that an optimally designed motor using our high-performance ferrite magnets NMF™-15 *1 (hereinafter referred to as "ferrite magnet motor") is able to achieve the same level of output as an xEV*2 traction motor using neodymium magnets (hereinafter referred to as "neodymium magnet motor"). Based on results from these simulations, we have built and evaluated an actual ferrite magnet motor prototype, and as a result have verified that it can produce output in excess of 100 kW which would be applicable for BEVs and PHEVs — types of vehicles that are expected to become mainstream going forward.

1. Background

In order to realize decarbonized societies, xEVs are expected to account for an ever-increasing percentage of vehicle production going forward. This is expected to lead to an increase in production of neodymium magnets used in traction motors and generators for xEVs. That being said, neodymium magnets use not only neodymium, which is classified as a light rare earth among rare earths, but also dysprosium and terbium, which are scarce heavy rare earths. As such, there are concerns that resource risks will increase with the growth in demand.

It was against this backdrop that Proterial's Global Research & Innovative Technology Center (GRIT) verified in simulations that ferrite magnets can be applied to traction motors for xEVs, and announced the results of its research on December 9, 2022. The response to this announcement, both domestically and from abroad, was extremely strong, and there were calls for us to conduct verifications on actual motors.

2. Overview

At Proterial, we have recently developed a prototype motor using our high-performance ferrite magnet (NMF™-15) and evaluated its performance. This motor uses a rotor (see photo) that was designed and fabricated based on results from our simulations (see table). A neodymium magnet motor for driving xEVs was used as the basis for comparison. Performance tests confirmed that, although performance was slightly lower than that shown in simulation results, an output in excess of 100 kW can be obtained, which is applicable to traction motors for BEVs and PHEVs which are expected to become mainstream from here on. Going forward, we will verify the difference between the results from simulations and results of tests on the actual motor to look into the possibility of making further improvements in motor performance.

Ferrite magnets have higher electrical resistance than neodymium magnets, and therefore contribute to suppressing eddy-current losses at high rotation speeds. We are committed to providing solutions to our customers' challenges, such as resource risk reduction and cost control, by presenting results from experiments on actual motors, and by proposing the use of ferrite magnets as an alternative for various applications where neodymium magnets have traditionally been used.

Photo: Rotor with ferrite magnets

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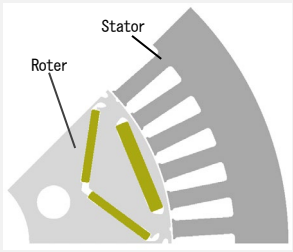
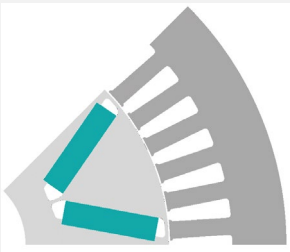
Table: Results from simulated xEV traction motor*3 and measurements taken on actual xEV traction motor

		Neodymium magnets used (Basis of comparison)	Ferrite magnets used Simulation results*	Ferrite magnets used Actual motor (part of rotor shown)
—Nd-Fe-B magnets —High-performance ferrite magnets NMF™-15G				
Design specifications	Max. rotational speed	10,000 rpm	15,000 rpm	15,000 rpm
	Thickness in axial direction	1 (ref.)	1	1
	Magnet Br	1 (ref.)	0.37	0.37
	Magnet weight	1 (ref.)	1.2	1.2
	Motor weight	1 (ref.)	1	1
Calculated values/ measured values	Max. output	110 kW	105 kW	102 kW
	Max. torque	1 (ref.)	0.66	0.63

* Designed for fixed rotor and stator diameters, taking into account operating temperatures and strength at high speeds.

End of report

*1: Proterial's proprietary material that exhibits among the world's highest level of magnetic properties as a mass-produced ferrite magnet (as of June 2023, according to our own research)

*2: General term for battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs)

*3: These are results of simulations performed using comparable motor. Results may vary depending on the motor.

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■About PROTERIAL

PROTERIAL

"Proterial" reflects the essence of our corporate philosophy, which consists of three elements: Mission: "Make the best quality available to everyone;" Vision: "Leading sustainability by high performance;" and Values: "Unfaltering integrity" and "United by respect." It combines "pro-" with the word "material."
"Pro-" represents our "three pros":

- Professional — work that exceeds expectations
- Progressive — a spirit that keeps challenging
- Proactive —an enterprising attitude

"Material" refers to the high-performance materials that our original technologies produce and underpinned by the three pros. With our focus on solving customer issues and bringing new levels of value, we promise to contribute to the realization of a sustainable society through the products and services that embody our philosophy.

■Movie introducing "PROTERIAL"

https://youtu.be/Q0MKdTh3ofI
Click here for movie

■Proterial, Ltd. — Company Overview

Established: April 1956
Head office: Toyosu Prime Square, 5-6-36 Toyosu, Koto-ku, Tokyo 135-0061, Japan
Capital: 310 million yen (as of March 31, 2023)
Representative: Representative Director, Chairman, President and Chief Executive Officer (CEO)
Sean M. Stack
Sales revenue: 1,118.9 billion yen (Term ended March 2023)
History: 1910: Founded as Tobata Foundry Co.
1937: Merged with Hitachi, Ltd.
1956: Established separately as Hitachi Metals Industries, Ltd.
2023: Company separated from the Hitachi Group, and renamed from Hitachi Metals, Ltd. to Proterial Ltd.

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