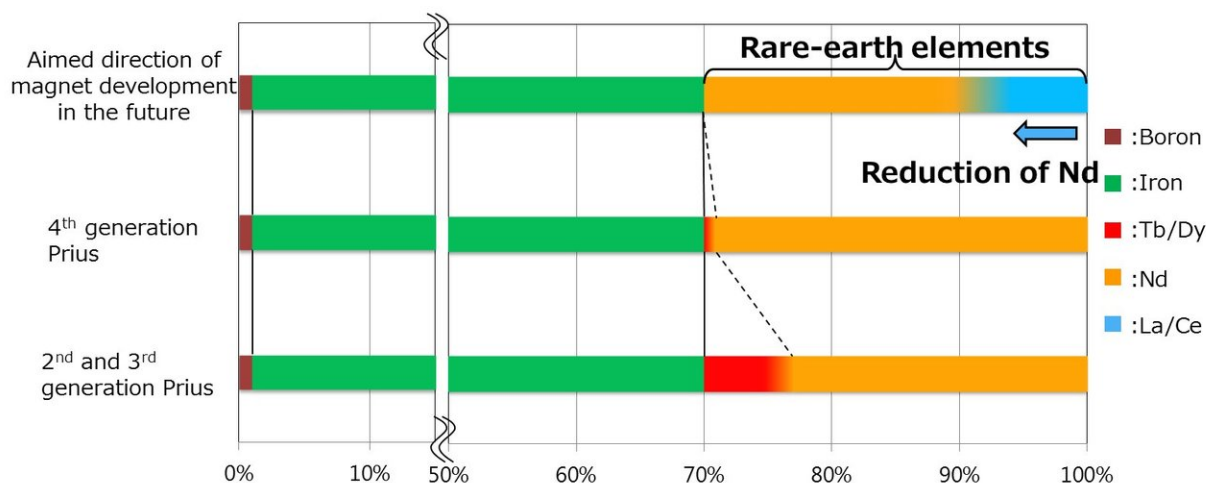


# Toyota's magnet lowers reliance on widely used rare earth element

February 22 2018, by Nancy Owano



Credit: Toyota

News from Toyota: On Tuesday the car maker announced it has a heat-resistant magnet that uses significantly less neodymium, a rare-earth element—reducing the amount of neodymium use by up to 50 percent.

Reuters called it a "key rare earth metal" for electric vehicle motors.

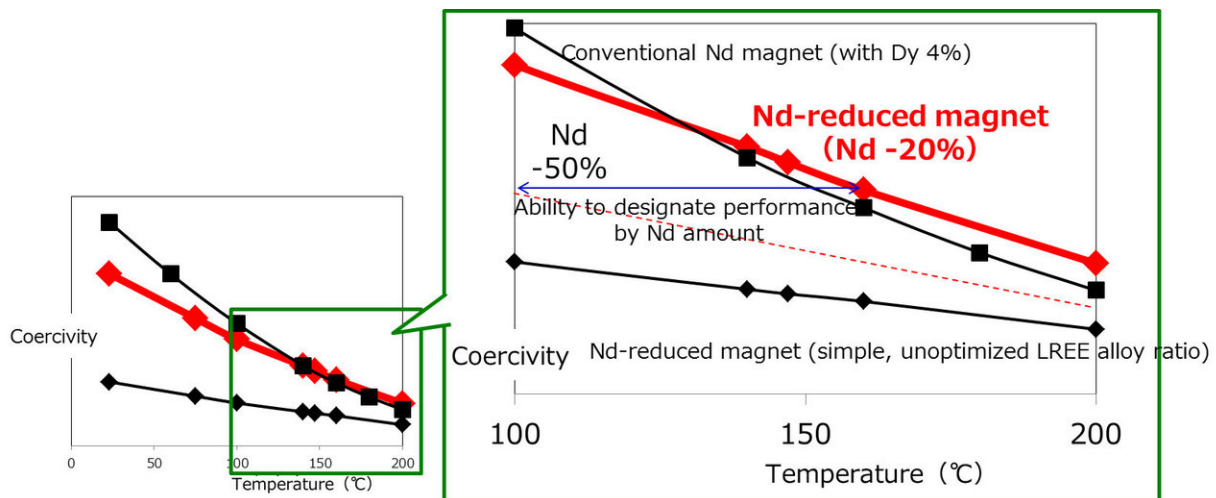
Great timing, said *Mining.com*, where Cecilia Jamasmie looked at the numbers.

She said prices of [neodymium](#) were still rising while [rare](#) earth exports from China dropped by 30% in 2010.

Akira Kato, general project manager at Toyota's advanced R&D and engineering company, addressed reporters at a briefing in Tokyo. Reuters reported his saying that "If we continue to use neodymium at this pace we'll eventually experience a supply shortage ... so we wanted to come up with technology which would help conserve neodymium [stocks](#)."

*Mining.com* wrote "there are concerns that shortages will develop as electrified vehicles, including hybrid and battery electric vehicles, become increasingly popular in the future. Despite this, little effort has been made to address neodymium use."

As for EV projections, the International Energy Agency's (IEA) expects the number of electric vehicles to reach around 40 million by 2040. This way, Toyota becomes less vulnerable to supply shortages.



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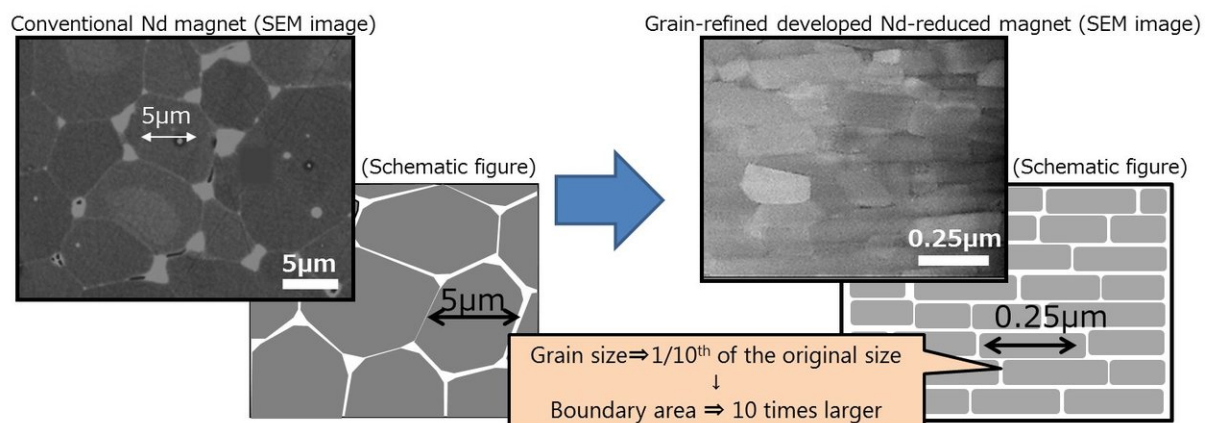
Not only does the new metal halve use of neodymium but it also eliminates the use of terbium and dysprosium. Toyota's announcement: "The newly developed magnet uses no terbium (Tb) or dysprosium (Dy), which are [rare earths](#) that are also categorized as critical materials necessary for highly heat-resistant neodymium magnets."

Thing is, said Reuters, magnets used in *most* automobiles to operate motors comprise a total of around 30 percent of the rare earth elements neodymium, terbium and dysprosium.

Automakers outside Toyota found ways to eliminate dysprosium and terbium from magnets by increasing the amount of neodymium.

That is where Toyota shows a different path. They are cutting out the expensive metals from the magnets but at the same time are reducing the amount of neodymium.

Toyota's solution involves lanthanum and cerium. Lanthanum and cerium carry two advantages: (1) they are more abundant rare earths and (2) cost about 20 times less than neodymium, said Jamasmie.



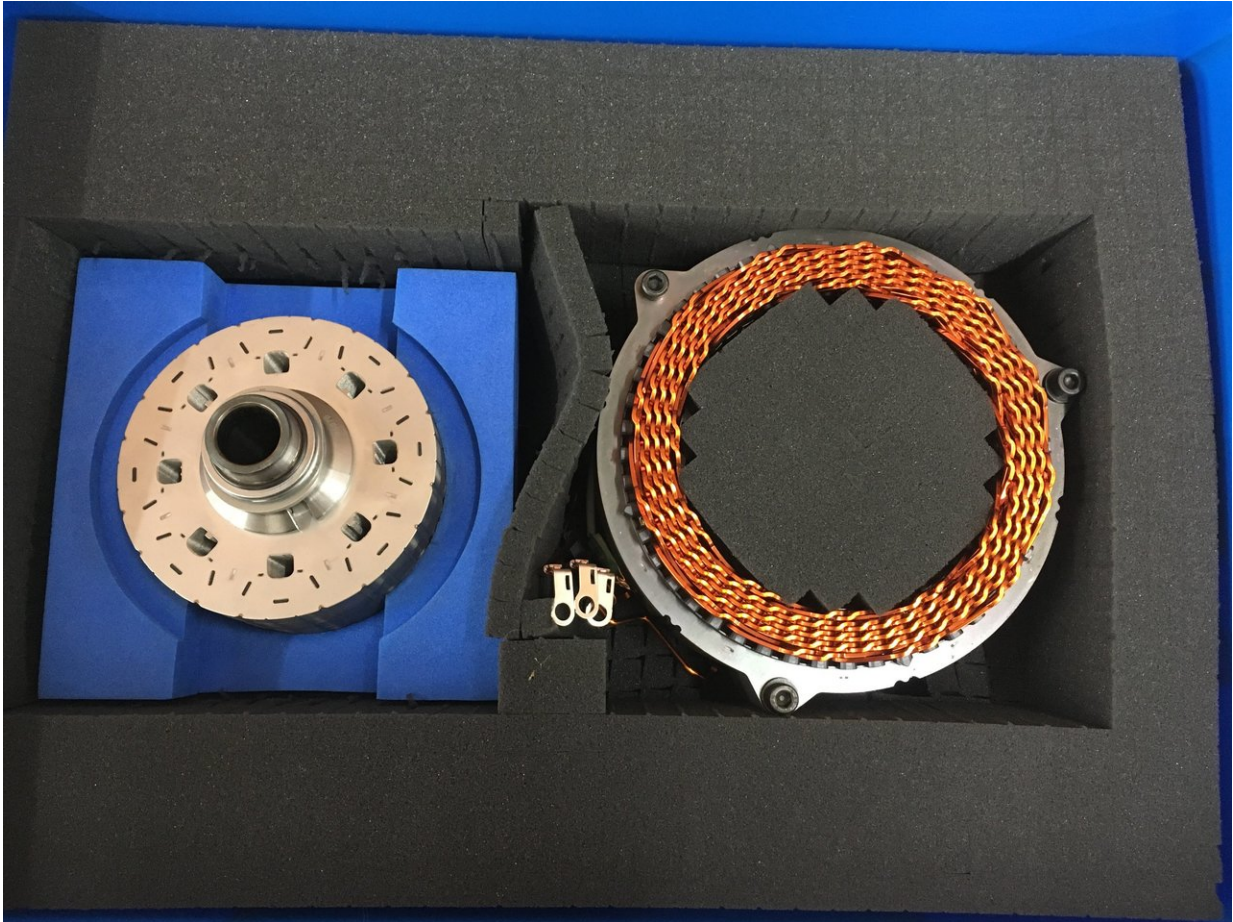
Credit: Toyota

At the same time, just reducing the amount of neodymium and replacing it with lanthanum and cerium would not work; the result would be a drop in motor performance. Toyota said it has "new technologies that suppress the deterioration of coercivity and heat resistance, even when neodymium is replaced with lanthanum and cerium."

Toyota said the new magnet has equivalent levels of heat resistance as earlier neodymium magnets, yet cuts the amount of neodymium used by up to 50 percent.

The announcement said the new heat-resistant magnet can maintain coercivity even at high temperatures because of the combination of these technologies: (1) Grain refinement of magnet (2) Two-layered high-performance grain surface and (3) Specific alloying ratio of lanthanum and cerium.

Kato, in the Reuters report, said that Toyota could replace up to half of the neodymium used in magnets for motors that operate conventional vehicle functions like power windows with lanthanum and cerium, and around 20 percent for electric motor magnets.



Credit: Toyota

What's next?

*Green Car Congress* said "the company will undertake development with the aim of practical application in high-performance electrified vehicle drive motors within the next 10 years."

**More information:** [newsroom.toyota.eu/toyota-develops-new-technology-for-high-performance-electrified-vehicles-element-by-element-by-up-to-50/](https://newsroom.toyota.eu/toyota-develops-new-technology-for-high-performance-electrified-vehicles-element-by-element-by-up-to-50/)

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