NEC TOKIN Corporation (President: Masakazu Okabe; Head office: Sendai, Japan) has developed a new energy efficient magnetic ribbon named "SENNTIX III*" jointly with Professor. Akihiro Makino of the Institute for Materials Research, Tohoku University, based on Prof. Makino's research. This revolutionary new material has the potential to greatly improve the power consumption of motors used in electric cars, and mid-sized and larger transformers used in electric power grids. Samples will be supplied starting this fiscal year.

This newly developed magnetic ribbon SENNTIX III enables to minimize the loss generated in the magnetic core (iron loss), which is a cause of loss in devices with high energy consumption, such as motors and transformers. SENNTIX III has been composed with Ubiquitous elements only and its iron proportion exceeds 90%. This makes it an Earth-friendly material that can be supplied stably at low prices.

SENNTIX III is the nanocrystalline micro-structured material (see Photo 1) with extremely low loss characteristic in the range of the saturation magnetic flux density over 1.8T (Tesla) discovered by Prof. Akihiro Makino. NEC TOKIN has conducted joint research with Prof. Makino to commercialize this revolutionary new material.

Over the past few years, there has been rapid growth in development of alternative forms of energy to fossil fuels. While use of solar and wind power has advanced, electric power grids have started being converted into smart grids, and electric vehicles (EVs) equipped with high-capacity batteries have also reached the level where their widespread adoption is possible. Although these technological innovations are effective at reducing emissions of greenhouse gases, which are believed to be a cause of global warming, a major breakthrough is still needed strongly in the effective utilization of energy, or in other words, reducing the energy loss of devices that use electricity.
The global electric-power consumption is currently 19,771 TWh (results from 2007), of which 672 TWh (3.4% of the total power consumption) is wasted as heat energy caused by iron loss** when motors and transformers consume power. Minimizing this loss will make that amount of power consumption unnecessary, which would significantly reduce carbon emissions.

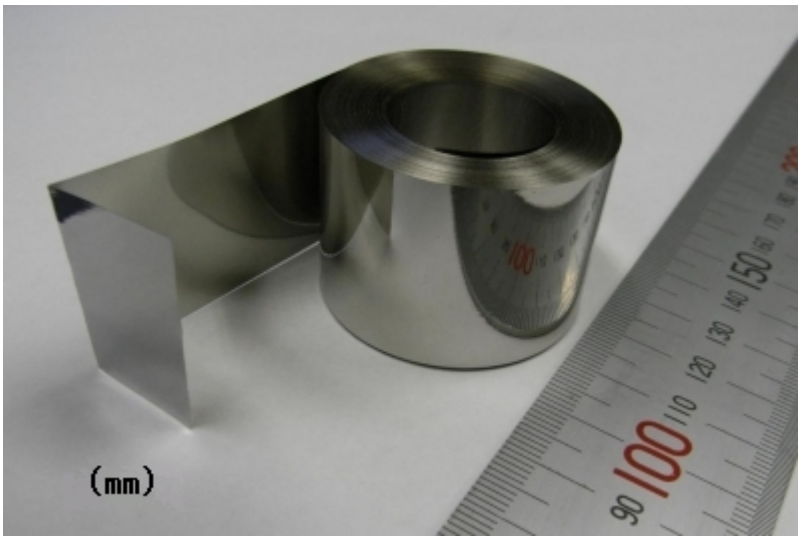


Photo 1 - SENNTIX III

The low-loss nanocrystalline material with high saturation magnetic flux density

Until now, the magnetic-core materials used in large current transformers and motors have required high saturation magnetic flux density and low iron loss, but until now, there had been no material with both of these qualities. For this reason, magnetic silicon steel ribbons would be used if saturation magnetic flux density was prioritized (smaller size), and iron-based amorphous ribbons would be used if low iron loss was prioritized.

SENNTIX III is a revolutionary new magnetic-core material that achieves what no material has been able to do before: deliver both high magnetic flux density and low iron loss. SENNTIX III exhibits significantly lower loss characteristics than conventional materials such as magnetic steel ribbons and iron-based amorphous ribbons (less than half that of magnetic silicon steel ribbons), while also improving saturation magnetic flux density (a weakness of iron-based amorphous ribbons) by 20%, and achieving high magnetic flux density (as high as that of magnetic silicon steel ribbons). This enables electric-power transformers and motors to be made much more energy efficient and smaller.

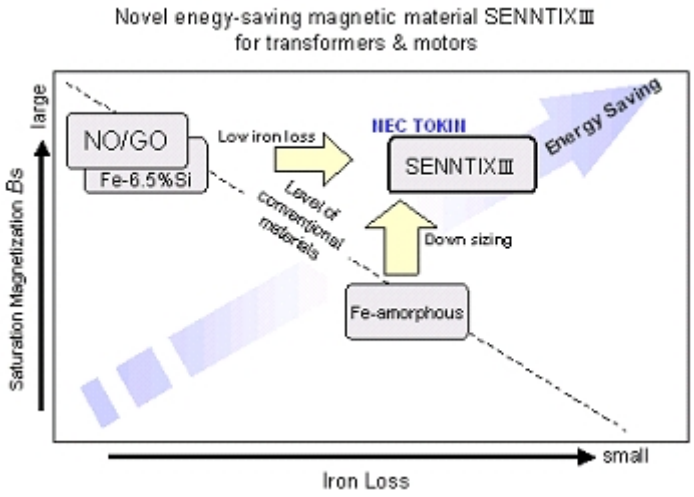
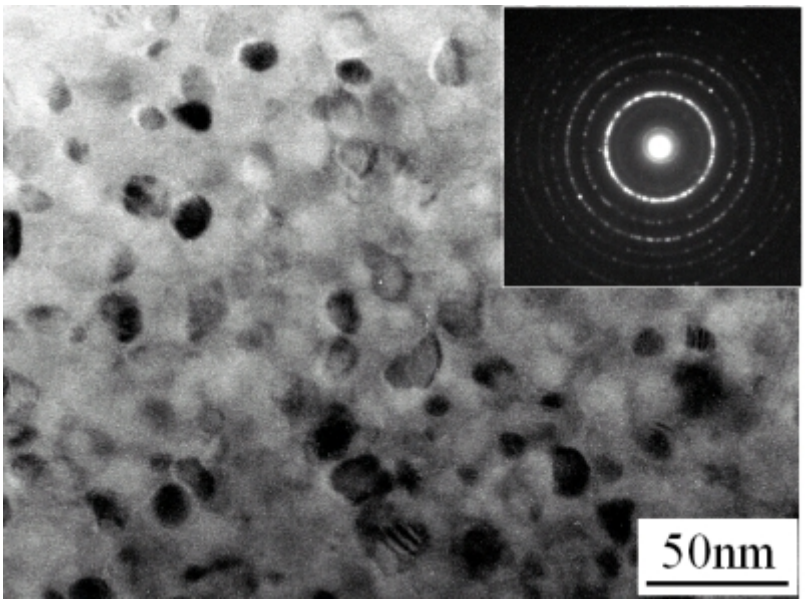


Figure 1 - Role of SENNTIX III



Transmission Electron Microscope (TEM) Image
of SENNTIX III, and Electron Diffraction Pattern

Currently, 97% of the cores of transformers and motors are taken up by magnetic steel ribbons, and the rest by iron-based amorphous ribbons. When SENNTIX III is used in the cores of the large transformers used on power-transmission grids, and the cores of motors with high power consumption, the amount of iron loss in the core is reduced greatly. It is estimated that this will save 297ML of petroleum in the world by the year 2020, and 2,829ML by the year 2030, which results in the large reduction of CO2. ***

NEC TOKIN will begin supplying samples to reactor and coil manufacturers this fiscal year, and will expand the target markets for SENNTIX III. At the same time, it will build a production system, and begin mass production and sales within a few

years. The company plans to supply the new material globally. Although initial production will start in Japan, SENNTIX III will be supplied to manufacturers of heavy electric machinery both in Japan and internationally.
Although the markets for both medium and large-sized transformers and motors are considered to be mature, they are expected to grow by about 1 to 5% per year, through improvements in energy efficiency and moves to the use of non-fossil energy. NEC TOKIN will start by expanding its business in the Japanese and international transformer markets, and in the future will enter the motor market as well.

* "SENNTIX III" is the name of a nanocrystalline soft magnetic material with low loss and high saturation magnetic flux density. It is being developed and commercialized jointly by Prof. Makino and NEC TOKIN, based on a revolutionary discovery by Prof. Makino at Tohoku University.

** "Iron loss" is the loss consumed by electromagnetic resistance in magnetic cores when current flows through transformers and motors. Because it is converted into heat, it is a source of electrical loss and heat generation.

*** Calculations compare iron loss in transformers, and iron loss in motors when the operating rate is 50%, to materials currently in use (grain-oriented magnetic steel (GO) for transformers, and iron based amorphous, non-oriented magnetic steel (NO) for motors). This does not take into account the reduction in copper loss that can be expected from a substitute for iron-based amorphous material, and in actual use a larger economic benefit than this can be expected.