Superconducting magnet generates world's highest magnetic field at 24T

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Superconducting magnets used in nuclear magnetic resonance (NMR) devices are required to generate higher magnetic fields because sensitivity and resolution increase with the strength of the generated field. On the other hand, in order to achieve a higher field, a large-scale superconducting magnet is needed. However, this caused the problem of increased consumption of liquid helium, which is necessary in cooling.

The NIMS research group fabricated a coil using a GdBCO thin film wire material (made by Fujikura Ltd.), which is an oxide high temperature superconducting wire material that displays excellent critical current density and mechanical properties in high fields. The developed coil was inserted on the inner side of a metal superconducting magnet that generates a field of 17.2T. As a result, we confirmed that it was possible to generate a field of 24.0T in the center of the magnet.

This is the world's highest value with a single superconducting magnet.

The previous world's record of 23.5T had been achieved by reducing the temperature to approximately 2K. In contrast, the new record was set at 4.2K (boiling point of liquid helium), as with other widely used superconducting magnets. The total size of the magnet was also greatly reduced. This achievement is an important advance in fabrication technology for high field coils using GdBCO thin film wire material, and also demonstrated the performance of this type of coil in a high field. Use of the developed technology is expected to enable a substantial reduction in the size of high field NMR devices, as well as reduced consumption of liquid helium.

Provided by National Institute for Materials Science

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