

UPDATE FROM THE CUTTING EDGE

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The abstracts of the recent research information appearing in Vol.10 No.4-6 of "AIST TODAY" are introduced here, classified by research areas. For inquiry about the full article, please contact the author via e-mail.

Environment and Energy

High-speed switching of high-voltage, high-power converter achieved by using SiC diodes Size reduction of large-scale power converter systems in social infrastructure

We have developed a high-voltage, high-power converter prototype (300 kVA single-phase three-level power converter) using switching modules with SiC-PiN diodes and Si-IEGTs. The switching frequency of the modules is 2 kHz, which is four times higher than the conventional switching module.

The new switching module uses 4×4 mm SiC diodes (6 kV-class), developed through AIST's technology for large-area SiC devices, and Toshiba's Si-IEGTs. In switching modules using Si-IEGTs and Si diodes, the switching frequency is limited to about 500 Hz because of the limitations of Si diodes performance. The use of SiC diodes, with their excellent switching characteristics, results in a higher switching frequency of the switching modules (2 kHz). Due to the high switching frequency, the three-level converter can be adopted and the insulating transformer can be eliminated. In addition, the filter capacity can be reduced. Great size reduction of power converter systems (one-fifth compared to the conventional system) becomes possible with this technology.

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SiC-PiN diodes (4×4 mm²) fabricated in AIST
SiC-PiN diodes fabricated on 2 inch 4H-SiC wafer.
A silver square area corresponds to one diode chip
(4×4 mm²).

