

Our Vanadium Dioxide Latent Heat Storage Material Has been Adopted as a Heat Control Material in Ultra-Small Satellites -Demonstration Experiment in Outer Space This Fall-

Nippon Denko Co., Ltd. (the "Company" or "we") hereby announces that the Company's high-performance vanadium dioxide (VO₂) latent heat*¹ storage material was adopted as a device for stabilizing the power supply temperature of DENDEN-01, an ultra-small satellite developed by a group led by Kansai University. (Project manager: Associate Professor Masaki Yamagata, Faculty of Chemistry, Materials and Bioengineering)

Satellites less than 100kg are called an ultra-small satellite, and the development and usage of CubeSats, whose standard structures are 10 cm³, is rapidly progressing. However, CubeSats are constrained by issues such as limitations on power, weight, and size, and their small heat capacity, thereby still being susceptible to abrupt temperature changes in outer space. In particular, a power supply which is one of the installed devices is extremely vulnerable to low temperatures, which significantly undermine their performance, causing malfunction to satellites.

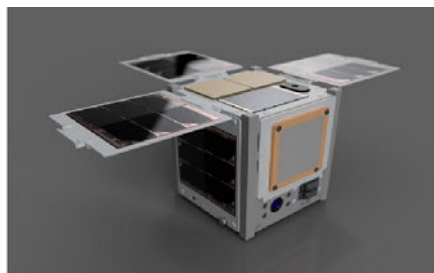
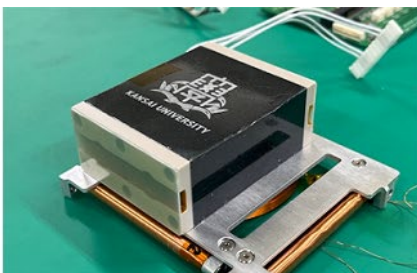
To tackle this issue and achieve a highly reliable power supply, the Company and Kansai University have jointly developed a vanadium dioxide (VO₂) latent heat storage material which responds to the severe temperature changes in outer space. This material has both heat storage and releasing capabilities, and demonstrates high performance by optimizing its transition temperature*² and transition responsiveness. Furthermore, a novel device for stabilizing the power supply temperature of satellites utilizing this material can expect the achievement of stable performance of a power supply by reducing the energy consumption in CubeSats when in operation and keeping the temperature of a power supply constant.

This device for stabilizing the power supply temperature of satellites will be installed in DENDEN-01, which was developed by the group led by Associate Professor Masaki Yamagata, and a demonstration experiment will be conducted in outer space.

Our high-performance vanadium dioxide latent heat storage material is expected to contribute to accelerating the development of ultra-small satellites with advanced functions and to the development of Japan's space industry.

*¹ Latent heat is the heat required for a material to undergo a phase change, with no temperature change.

*² Transition temperature is the temperature which causes crystal structure changes and heat can be absorbed or released with this change.



Left image: A device for stabilizing the power supply temperature adopting vanadium dioxide latent heat storage material

Central image: Demonstration satellite DENDEN-01 deploying its solar array wings

Right image: Conceptual image in outer space

[Related link]

Kansai University News Release:

Kansai University, University of Fukui, Meijo University, and ArkEdge Space Inc. Jointly Developed an Ultra-Small Satellite Called "DENDEN-01" Equipped with Multiple Energy Technologies, Including a New Power Supply Temperature Management System: Schedule to be Launched from the International Space Station This Fall

https://www.kansai-u.ac.jp/ja/about/pr/pressrelease/2024/06/post_77583.html (only in Japanese)

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