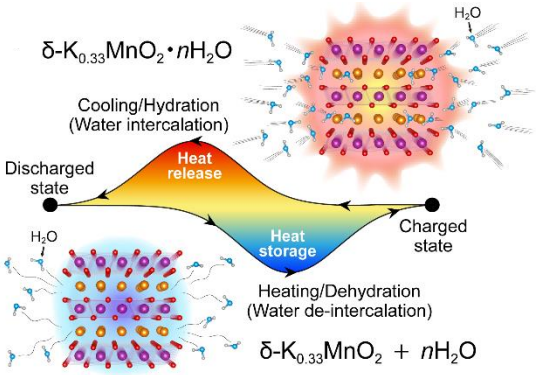
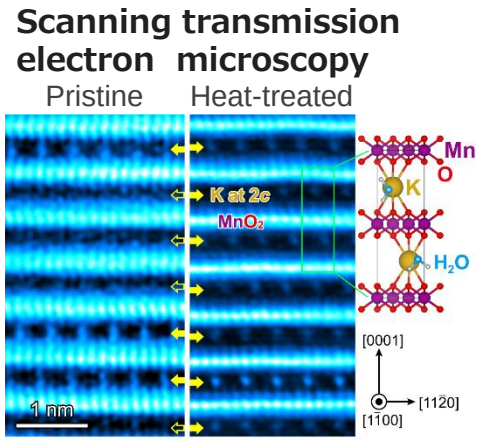
Tohoku Univ. Technology

HEAT STORAGE MATERIAL AND METHOD FOR USING HEAT ENERGY

Excellent energy density, reaction rate, and reversibility



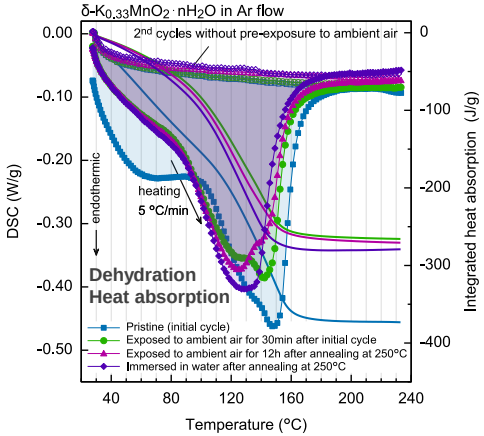


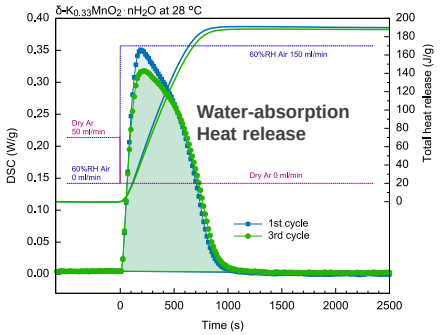
Overview

In recent years, attention has been focused on the development of technologies for effective utilization of sustainable energy from the viewpoint of global environmental protection. It is desirable to construct a heat recovery system that effectively utilizes low-grade waste heat of 100 to 200ºC, which accounts for most of the waste heat from factories. To realize this, various heat storage materials have been proposed. However, as the heat absorption/release reactions generally involve large changes in the crystal structure, the slow reaction rates and irreversibility of the reactions have been challenging issues, especially in the low temperature range.

The present invention makes it possible to provide a heat storage substance that can accommodate a large amount of heat even in a low temperature region of low-grade waste heat. The research revealed that the layered manganese dioxide, which has long been used as an electrode material in batteries, can repeatedly absorb and release heat by releasing and absorbing environmental water at a sufficiently rapid rate.

Differential Scanning Calorimetry





This substance exhibits a water-intercalation mechanism.

Product Application

- Thermal energy storage
- Heat recovery system

Related Works

[1] T. Hatakeyama, N. L. Okamoto, S. Otake, H. Sato, H. Li, T. Ichitsubo, Excellently balanced water-intercalation-type heat-storage oxide, Nature Commun., **13**, 1452 (2022).

[2] N. L. Okamoto, H. Yoshisako, T. Ichitsubo, Effect of interlayer K ordering on water intercalation behavior in δ-type layered manganese dioxide, Energy Storage Mater., **61**, 102912 (2023).

IP Data

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