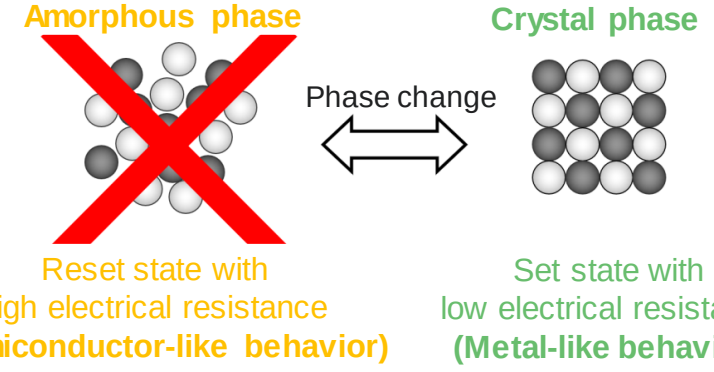
Tohoku Univ. Technology

Non-volatile memory materials that occur phase change between their crystal phases

Realization of phase-change memory with high speed, thermal stability and low energy operation



Overview

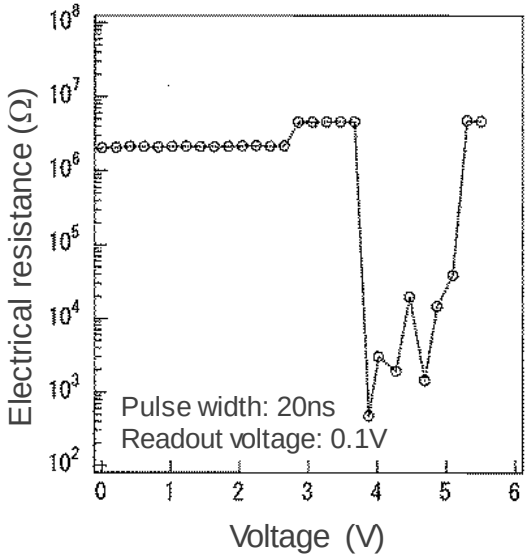
In recent years, the data traffic on internet around the world has been increasing rapidly and there is a strong need to innovate the non-volatile memory for data storage. In particular, phase-change memory (PRAM) has been attracting attention since the practical use in storage class memory has already begun. In general, PRAM records ON/OFF at 2 states: crystal phase with low electrical resistance and amorphous phase with high electrical resistance.

However, the operation requires the use of amorphous phase so the heat resistance is poor and generates high power consumption during melting to the amorphous phase. Actually, there is a high expectation for creating a non-volatile memory element which solve these issues.

The most important feature of this invention is that the non-volatile memory material is in crystal phase for both ON/OFF status. Since this material does not require melting to the amorphous phase, it is thermally stable and has low power consumption. Therefore, a significant operating energy reduction can be realized. Moreover, it has excellent high-speed property because a large resistance variation can be obtained through phase change between the crystal phases. Tohoku University proposes 3 types of non-volatile memory material : **① MnTe, ② Nitride-based material, ③ Rare-earth material**.

Phase change material lineup and their features

①MnTe: quick response and low phase-change energy.
②Nitride-based material: realization of chalcogen-free memory.
③Rare-earth material: quick response and low phase-change energy.



Product Application

- ☐ Semiconductor memory
- ☐ Logic element

Related Works

[1] Nature Communications, 11, (2020), 85. (MnTe)

IP Data

IP No.	:	① JP2019-153621/ ② JP2021-019090/ ③ PCT/JP2021/028946
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