

Low temperature sintering of BaTiO₃ using sodium vapor

PTC thermistors can be fabricated in a simple and cost-effective manner.

Overview

Some semiconducting ferroelectric ceramics exhibit positive temperature coefficient (PTC) thermistor behavior, in which their electrical resistivity increases drastically above the Curie temperature. Materials based on perovskite-type barium titanate (BaTiO₃) are widely used as circuit protection devices under conditions of high temperature or large current surges.

Conventional methods to change originally insulating BaTiO₃ powders to semiconductor require highly reducing atmospheres and high sintering temperatures near 1400 °C.

This invention proposes a low-temperature and cost-effective fabrication method for BaTiO₃-based semiconducting ceramics using sodium (Na) vapor. Grain size control in ceramic products is also possible upon sintering using the present technique.

Product Application

- PTC thermistor material (ceramic form)
- Monolithic-type PTC thermistor element

IP Data

IP No. : JP2025-028183
Inventor : HOSONO Akira, YAMADA Takahiro
Admin No. : T25-003

As the patent application has not yet been published, technical details—including the application specification—will be disclosed after the conclusion of a technology transfer agreement. Please feel free to contact us for further information.

Fabrication flow of BaTiO₃ semiconducting ceramics

Semiconducting and sintering processes at temperatures over 500 °C lower than conventional methods.

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Related Works

[1] Received the 58th (Spring 2025) Annual Meeting Young Scientist Presentation Award of the Japan Society of Applied Physics
<https://www.jsap.or.jp/young-scientist-presentation-award/recipients58>

Contact

Tohoku Techno Arch Co., Ltd.

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