Tohoku Univ. Technology

The technology to improve tunnnel diode rectification performance

Introducing a nanoparticle layer into MIM tunnel diodes to significantly improve rectification performance!

Overview

- Metal/insulator/metal tunnel diodes (MIM tunnel diodes) are used when rectifying signals of frequencies in **the infrared and terahertz regions**.
- However, it is difficult to improve the rectification performance because **there is a trade-off between electrical resistance and asymmetry.**
- The invention has solved the above issue **by introducing metallic nanoparticle layers (NPs)** into the MIM tunnel diodes and changing **the tunnel barrier at forward and backward biases** by the effect of electric field concentration.
- Since the invention has **greatly improved rectifying performance** compared to tunnel diodes without NPs, the present tunnel diodes can be expected to be used to **high-frequency devices (Optical rectenna, IR, THz detector)**.

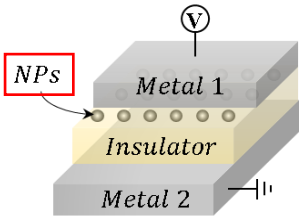
Product Application

- ☐ Optical rectenna
- ☐ IR, THz detecter

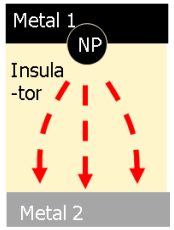
IP Data

IP No.	:	JP2023-088181
Inventor	:	SHIMIZU Makoto, LIU Zen, HIROO Yugami
Admin No.	:	T22-255

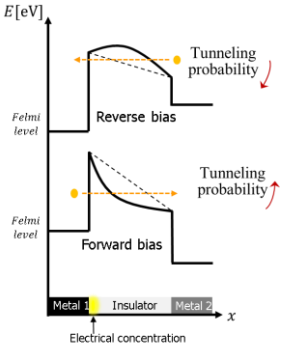
Features･Outstandings



Introducing NPs to MIM tunnel diode

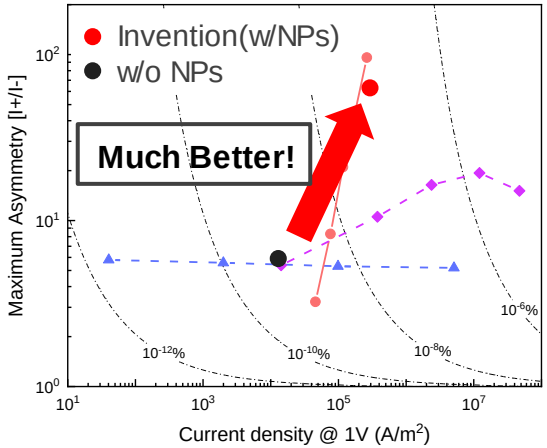


Electric field concentration



Tunnel barrier Changes

⇒ Improve asymmetry



Asymmetry
⇒ 10 Times!
Current density
⇒ 20 Times!

Related Works

[1] Zen Liu, Shunsuke Abe, Makoto Shimizu, Hiroo Yugami
Appl. Phys. Lett. **122**, 093502 (2023)

Contact

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Please visit CONTACT here