

The technology to improve tunnel 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)**.

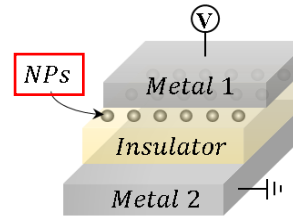
Product Application

- Optical rectenna
- IR, THz detector

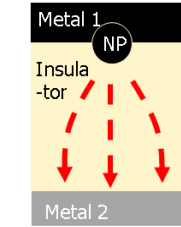
IP Data

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

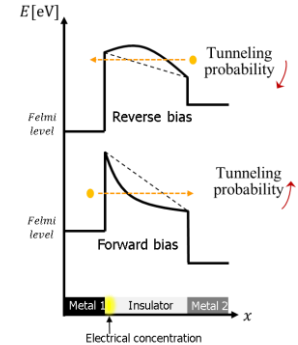
Features·Outstandings



Introducing NPs to MIM tunnel diode

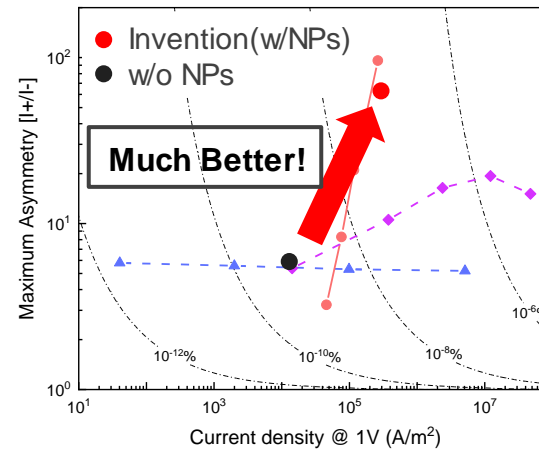


Electric field concentration



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

Download OnePager



Contact

<https://www.t-technoarch.co.jp/en/contact.html>



Check Out Our Inventions

<https://www.t-technoarch.co.jp/en/anken.php>



Follow us

<https://www.linkedin.com/company/tohoku-techno-arch>



Leading you to Successful Industrialization



TOHOKU TECHNO ARCH

株式会社 東北テクノアーチ