Large-Area CMOS-Compatible Infrared Rectenna

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Problem Statement

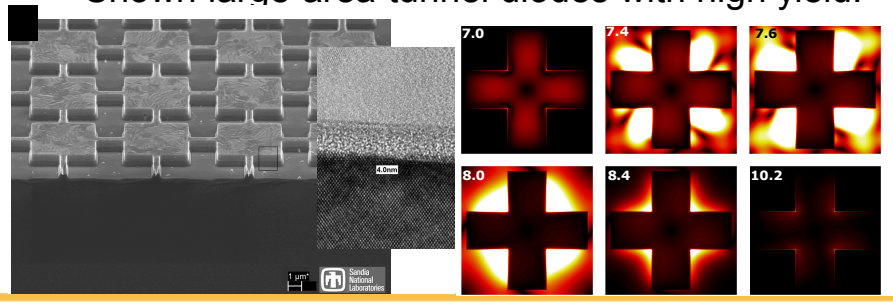
- Moderate thermal sources (200-350°C) are difficult for thermoelectric converters. Efficiency drops significantly in temperature range.
- Improvement in thermoelectric figure of merit ZT is a significant materials challenge. Mature research field spanning many decades.
- Complex alloyed materials difficult to fabricate into device geometries.
- Must contact thermal source.

Approach

- Large-area IR nanoantenna-coupled CMOS fabricated tunnel diode rectifier. Current device sized 1cm^2 scale to $\pi(15)^2$ cm^2 ~ 700 cm^2
- Phonons in polar oxides enhance IR field confinement by orders of magnitude.
- Highly engineered asymmetric distributed tunnel diode leads to large photocurrent.

Potential Solutions

- Direct conversion of radiated thermal light. Need only view thermal source.
- Leverage CMOS technology with trillions of $$$ invested in Si manufacturing.
- Shown large-area tunnel diodes with high yield.



Scientific & Technical Challenges

- Broadband rectification requires different polar oxides and broadband nanoantenna designs.
- Full-wave rectification.
- Is a current source, need integrated load.