Infrared Detector with Impedance-Matched a THz Slot Antenna and a M-I-M Diode on a Ultra-Thin Membrane

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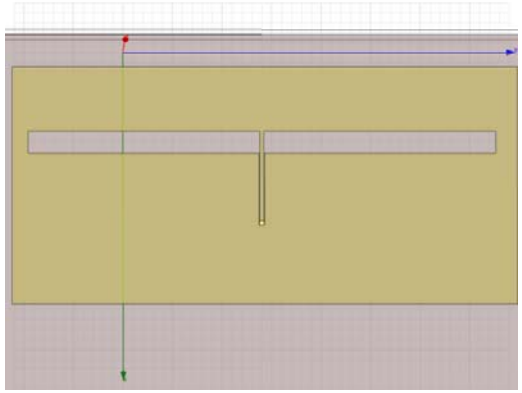
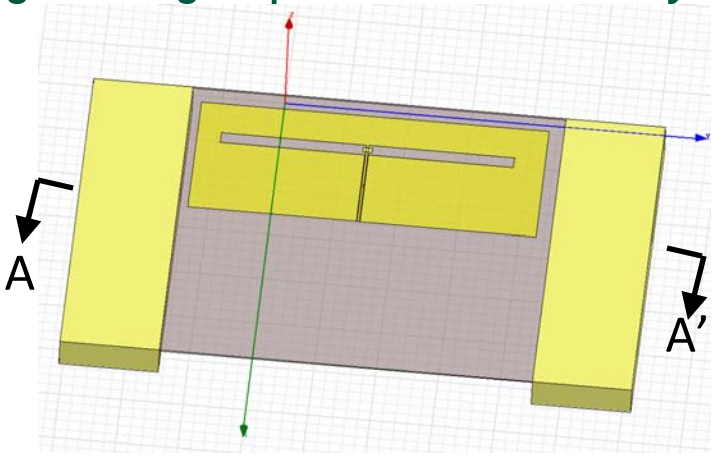
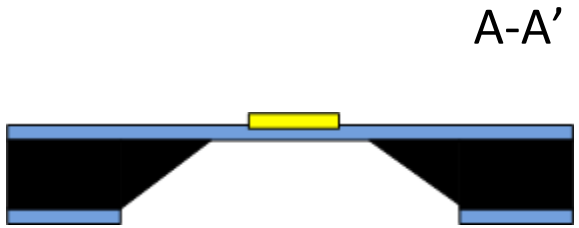


Top-View



3D schematic-view



Cross-sectional View

The Key Technical Challenges :

- Derivation of a frequency-dependent modeling of the antenna and the diode.
- Choosing the appropriate materials for THz applications.

Our Approaches:

- Antenna characterization and optimization by bolometer-based detectors.
- Integration of antenna and MIM-diode detector by conjugate matching of the antenna to the input impedance of the diode detector.

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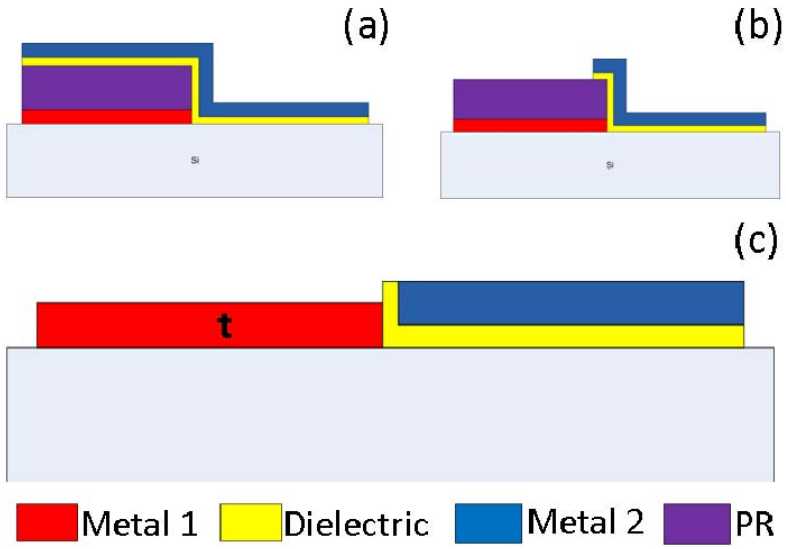
Fabrication of Metal-Insulator-Metal Diodes with Nano-Scale Junction



(a) Deposit **metal 1** and use **PR** to pattern it. Without stripping the PR, we deposit two uniform layers of **dielectric** and **metal 2**.

(b) Pattern both the dielectric layers and the **metal 2** layer.

(c) Strip the resist after it being exposed. The stripping action should break the edge off.

Technical Challenges:

- The junction capacitance need to be extremely small (low capacitance).
- Input resistance need to be kept low to facilitate integration with antenna.
- Dielectric layer needs to be ultra thin for tunneling to occur.

Our Approaches:

- Formation of ultra-thin and nanoscale junction by ALD along with a revised “lift-off” process.
- Choosing the right materials and design to achieve asymmetric I-V characteristics.

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