Simulating Infrared Transmission Through a Porous Dielectric Foam

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Infrared Radiation
Infrared Radiation
Dielectric Foam

• Filter
  – Allows transmission of preferred frequency, excludes unwanted frequencies

• Absorption, reflection, scattering
Potential Applications

• ICESat-2
  – Cryogenically cooled detectors
• Cosmic Microwave Background satellites
  – Reduce measurement noise
Project Goal

• Simulate transmission of infrared radiation
  – Reflection, absorption, scattering thermal infrared radiation

• **Determine optimal dielectric width** by generating plots of transmission vs. frequency
What is Zitex?

- Fibrous-porous Teflon
- Zitex can be used as a frequency filter for infrared radiation
Simulator Variables

- Electric permittivity
  - Propagation of light
  - Absorption (scattering is function of squared freq.)

- Absorption poles
  - Absorption strength
  - Absorption frequencies

- Phase decoherence
Decoherence

- Initial decoherence of incident wave
- Decoherence due to surface roughness

Rough surface causing decoherence
Zitex G-110 Data

- Complex dielectric constant
Zitex G-110 Data

- Add scattering effect, dielectric function
Zitex G-110 Data

- Add rotational absorption poles
Results

• Developed simulator that accurately fits measured spectra
• Can be used to determine optimal dielectric width
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References


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