Nanotechnology Fabrication of Polysilicon Film/Metal Grid Infrared Filters

Brian Hicks, Milt Rebbert, Pete Isaacson, Christie Marrian, Jackie Fischer
Naval Research Laboratory

Howard Smith
Smithsonian Astrophysical Observatory

Peter Ade, Rashme Sudiwala
Queen Mary and Westfield College

Matt Greenhouse, Harvey Moseley, and Ken Stewart
NASA Goddard Space Flight Center

We have studied the possibility of making high transmission, precisely controlled FIR filters from stacks of precisely formed metal grids separated by thin polysilicon films. The grids are photolithographically deposited using techniques[1] we have patented for metal mesh Fabry-Perot etalons. The polysilicon films are evaporatively deposited using new silicon technology. With the current fabrication techniques we could make filters usable from about 20 microns and longward.

It is observed that commercial crystalline silicon has small absorptions in the FIR which, when "amplified" by the presence on its surface of a resonant metal grid, limit the transmission of any filter of which it is a part. We have prepared a set of samples using our preferred polysilicon films, and present their transmission properties. We discuss the potential and/or limitations of polysilicon devices.

References:
[1]Rebbert, M., et al. 1994, Applied Optics, 33, 1286

Acknowledgments:
We gratefully acknowledge the support of NASA and the Office of Naval Research.