

Angular Photonic Band Gap

Technology #14368

Applications

Angular photonic band gaps transmit or absorb electromagnetic radiation based on the polarization and reflecting electromagnetic radiation of certain frequencies. Applications for this effect are found in solar energy, as this technology enables a nearly perfect greenhouse effect. Also, this invention will be useful for structures designed to "trap" light of a known incidence angle.

Problem Addressed

An issue with current technology is the low efficiency of the solar-energy conversion, which is limited by re-radiation of sunlight, consequently causing energy loss. This invention demonstrates how light close to normal incidence can be near perfectly transmitted, independent of polarization. Moreover, this invention uses photonic crystals whose constituents have an anisotropic dielectric and/or magnetic response to enable such transmission.

Technology

This invention presents a novel class of material systems that strongly discriminate light based on the angle of incidence, over a broad range of frequencies, and irrespective of the polarization. The meta-material system proposed consists of a one-dimensional periodic photonic crystal whose constituents possess anisotropic properties. This photonic material comprising of a plurality of photonic crystals can be used to selectively transmit and/or selectively absorb one portion of incoming electromagnetic radiation while reflecting another portion of incoming electromagnetic radiation. The design structure opens an angular gap for both polarizations over a certain frequency range with the possibility of enlarging the frequency range to the specific angular discrimination desired.

Advantages

- Reduces energy loss
- Wider range of light that can be identified

Categories For This Invention:

Energy

Energy Harvesting

Solar

Photovoltaics

Thermal PV

Solar Thermal Conversion

Intellectual Property:

Discriminating electromagnetic radiation based on angle of incidence

Issued US Patent

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Discriminating electromagnetic radiation based on angle of incidence

US Patent Pending

Inventors:

John Joannopoulos

Marin Soljacic

Peter Bermel

Ivan Celanovic

Rafif Haman

Michael Ghebrebrhan

Adrian Yeng

Publications:

Turning Heat into Power

MIT News

February 3, 2012

Building a Better Suntrap

The Economist

Dec 31, 2011

External Links:

Photonics and Modern Electro-Magnetics Group

<http://www.rle.mit.edu/marin/>

Research Laboratory of Electronics

<http://www.rle.mit.edu/>

Joannopoulos Research Group

<http://ab-initio.mit.edu/>

Center for Materials Science and Engineering

<http://mit.edu/cmse/>

Image Gallery:

255 Main Street, room NE 18-501

Cambridge, MA 02142-1601

Phone: 617-253-6966 Fax: 617-258-6790

<http://tlo.mit.edu>

Contact the Technology Manager: tlo-inquiries@mit.edu

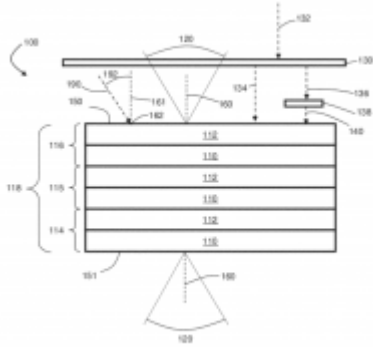


FIG. 1A