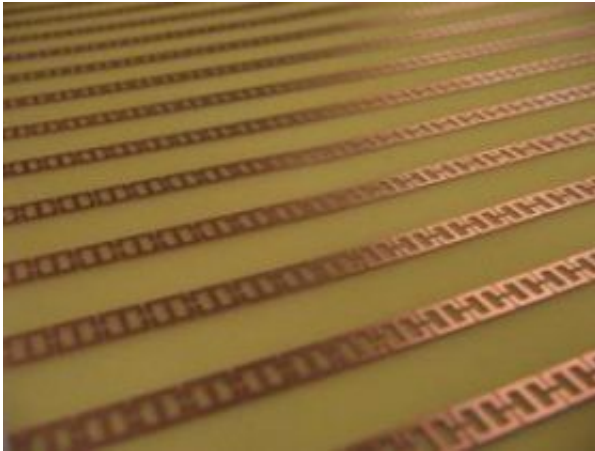


New Metamaterial a 'Perfect' Absorber of Light

June 3 2008



Researchers have engineered a metamaterial that uses tiny geometric surface features to successfully capture the electric and magnetic properties of a microwave to the point of total absorption. Image courtesy of Boston College

A team of scientists from Boston College and Duke University has developed a highly-engineered metamaterial capable of absorbing all of the light that strikes it – to a scientific standard of perfection – they report in Physical Review Letters.

The team designed and engineered a metamaterial that uses tiny geometric surface features to successfully capture the electric and magnetic properties of a microwave to the point of total absorption.

“Three things can happen to light when it hits a material,” says Boston College Physicist Willie J. Padilla. “It can be reflected, as in a mirror. It can be transmitted, as with window glass. Or it can be absorbed and turned into heat. This metamaterial has been engineered to ensure that all light is neither reflected nor transmitted, but is turned completely into heat and absorbed. It shows we can design a metamaterial so that at a specific frequency it can absorb all of the photons that fall onto its surface.”

In addition to Padilla, the team included BC researcher Nathan I. Landy, Duke University Professor David R. Smith and researchers Soji Sajuyigbe and Jack J. Mock.

The group used computer simulations based on prior research findings in the field to design resonators able to couple individually to electric and magnetic fields to successfully absorb all incident radiation, according to their findings.

Because its elements can separately absorb the electric and magnetic components of an electromagnetic wave, the “perfect metamaterial absorber” created by the researchers can be highly absorptive over a narrow frequency range.

The metamaterial is the first to demonstrate perfect absorption and unlike conventional absorbers it is constructed solely out of metallic elements, giving the material greater flexibility for applications related to the collection and detection of light, such as imaging.

Metamaterial designs give them new properties beyond the limits of their actual physical components and allow them to produce “tailored” responses to radiation.

Because their construction makes them geometrically scalable,

metamaterials are able to operate across a significant portion of the electromagnetic spectrum.

Published by the American Physical Society, the article can be viewed at [scitation.aip.org/getabs/servlet ... dtype=cvips&gifs=yes](https://scitation.aip.org/getabs/servlet?url=/servlet/documentReference&url=https://doi.org/10.1063/1.2894441&dtype=cvips&gifs=yes)

Source: Boston College

Citation: New Metamaterial a 'Perfect' Absorber of Light (2008, June 3) retrieved 24 May 2024 from <https://phys.org/news/2008-06-metamaterial-absorber.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--