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# Proposed metamaterial could have a wide range of applications, from sensing to stealth technology

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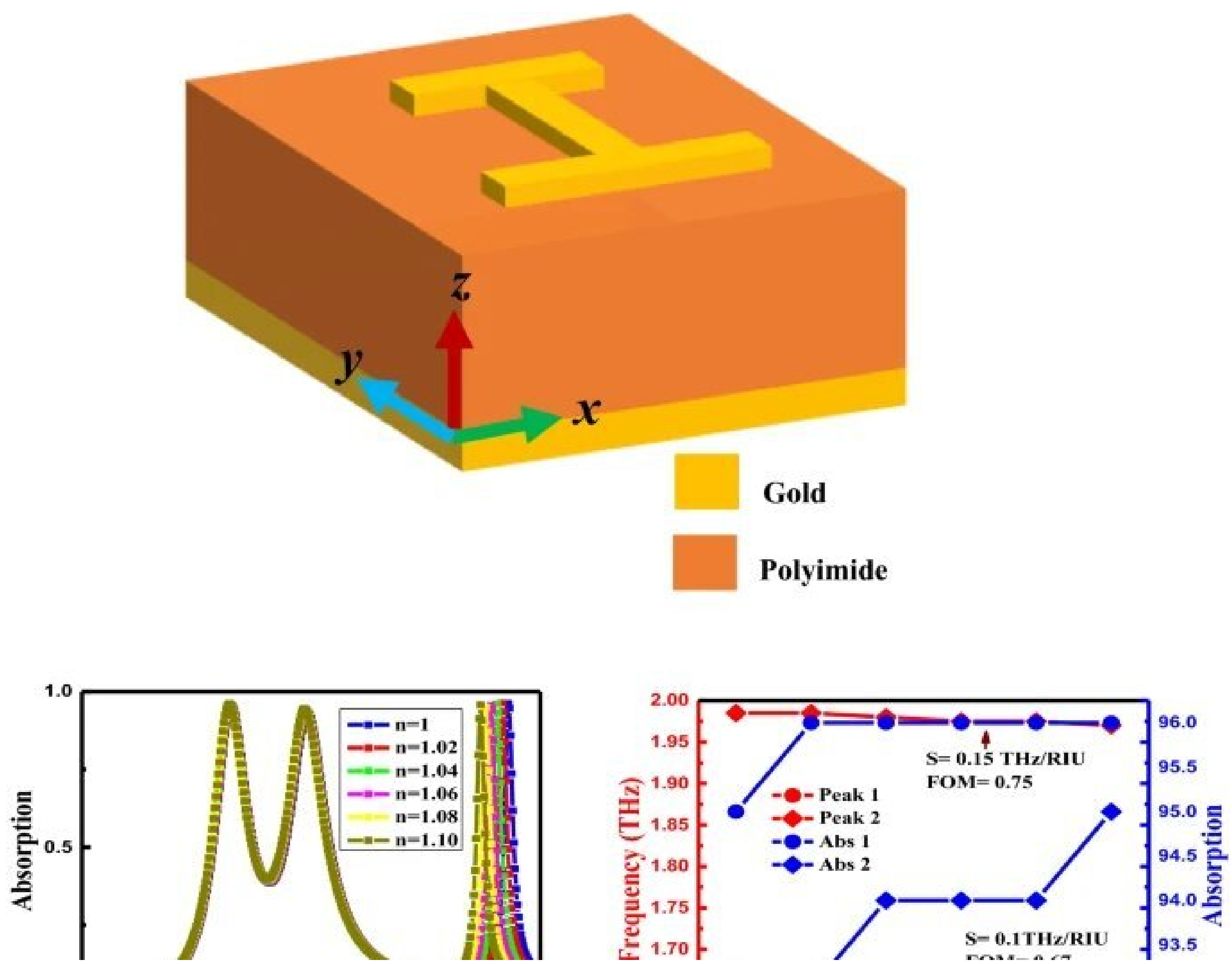


Graphical abstract. Credit: *The European Physical Journal D* (2023). DOI: 10.1140/epjd/s10053-023-00658-w

Metamaterials are a type of artificial material which, as the prefix "meta"—meaning in Greek "after" or "beyond"—indicates, demonstrate electromagnetic properties and other characteristics not found in nature.

As a result of these characteristics, including negative refraction and perfect lensing and cloaking, which arise from the lattice design composition of these substances rather than the materials that actually comprise them, metamaterials have become a hot research topic.

In particular, materials scientists are actively hunting for metamaterials that are "perfect absorbers" of electromagnetic radiation with controllable resonance characteristics that lead to their wide usage in applications as varied as solar cells, thermal radiation imaging, sensing technology, and even stealth technology.

In a new paper in *The European Physical Journal D*, Shahzad Anwar, a researcher at the Department of Physics, Islamia College Peshawar, Pakistan, and his colleagues document the proposed design of a triple-band perfect metamaterial absorber. The new metamaterial could have applications in sensors, filters, and in stealth technology.

"The aim of this work is to achieve a multiband metamaterial absorber and to improve the sensing performance of the multiple band absorbers for their potential applications in optical filters and sensing devices," the authors write. "The novelty of our work has two major aspects. Firstly, it simplifies the design structure of multiband metamaterial absorbers in the terahertz region. Secondly, it enhances the sensing performance of multiband metamaterial absorbers, which is highly beneficial in improving the design [of] sensing devices."

The team's proposed design consists of a gold metallic array, a metallic layer, and a dielectric spacer between the two. Testing by the team demonstrated that the metamaterial perfect absorber has three resonant modes at frequencies 1.655 THz, 1.985 THz, and 2.86 THz, in which an average absorption rate close to 95% was achieved.

The authors also found that by varying the structural parameters of their proposed material, the frequencies of its resonant modes can be tuned.

"These results show that high-order resonance response is much greater in terms of sensing performance than that of the fundamental mode resonance," they added. "In other words, these studies provide us with a new way to design high-sensitivity sensors."

**More information:** Shahzad Anwar et al, Triple-band terahertz metamaterial absorber with enhanced sensing capabilities, *The European Physical Journal D* (2023). DOI: 10.1140/epjd/s10053-023-00658-w

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