Highly efficient and ultrabroadband light absorption metamaterial for energy applications

Researchers from the Consejo Superior de Investigaciones Científicas (CSIC) and the Catalan Institute of Nanoscience and Nanotechnology (ICN2-BIST) have developed a novel cost-effective and scalable metamaterial showing an angle-independent and efficient ultrabroadband optical absorption range (average 84% within 300 to18000 nm), which results in an excellent photothermal conversion efficiency.

Manufacturing companies working in solar thermal energy, energy harvesting, or mechanical actuators are being sought to collaborate and/or exploit the existing know-how through a patent license agreement.

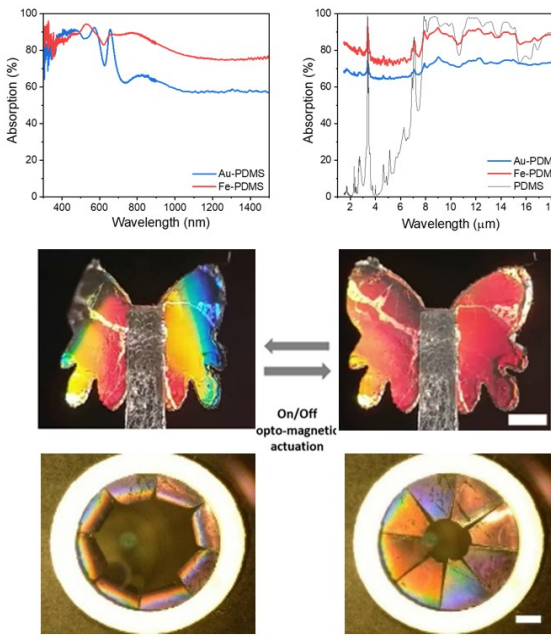
An offer for Patent Licensing

Excellent photothermal conversion efficiency

The developed metamaterial exploits the highly damped plasmonic properties of abundant, cost-effective and scalable nanostructured metals (Fe, Ti, Ni…) in combination with plastic films to achieve the ultra-broadband absorption range from the UV to the far infrared. The flexibility of the metamaterial enables its straightforward attachment to any flat or curved surface.

The fabrication method can also be adapted to complex 3D surfaces. The metamaterial can be applied to:

- Conversion of light into heat for energy harvesting or enhanced catalytic applications
- Non-refrigerated photodetectors
- Photo-thermal actuators
- Self-regulated and dynamic pupil/iris.



Fabricated material absorption range (top). Examples of photothermal and magnetic actuators based on the metamaterial

Main innovations and advantages

- Broader spectral absorption range (300 nm-18 μm)
- Absorption independence on the light angle of incidence
- Higher photothermal conversion efficiency (2-fold higher) than typical plasmonic materials (e.g., Au, Ag, Al) and at much lower cost.
- Flexibility to adapt the metamaterial to flat or curved surfaces.
- Possibility of in situ fabrication of the metamaterial in any flat or 3D substrate.
- The ferromagnetic properties of the proposed materials enable the detection or combined actuation with light and magnetic fields.

Patent Status

Priority patent application filed suitable for international extension

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