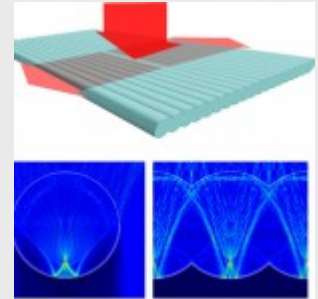


## Intermittent Chaos for Ergodic Light Trapping in a Photonic Fiber Plate

Article: published in [Light: Science & Applications](#) by Jorge Bravo-Abad, Department of Theoretical Condensed Matter Physics and IFIMAC researcher.

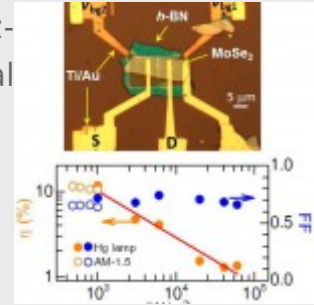


**L**ight trapping and guiding in thin films combined with efficient light extraction or insertion in the direction orthogonal to the guiding one is essential to obtain energy-efficient light harvesting or emission. In this context, one is faced with two seemingly incompatible constraints -namely, to let as much light in or out as possible at any point on the guiding film surface while maintaining the light effectively trapped across the film. For several decades, in an attempt to maximize sunlight energy harvesting, researchers of thin film solar cells have been searching for the optimal system architecture to achieve the most effective light path ‘bending’ into the cell absorber layer. In a collaboration between the [Departamento de Física Teórica de la Materia Condensada](#) and the [Condensed Matter Physics Center \(IFIMAC\)](#) at the [Universidad Autónoma de Madrid](#), the [Institute of Photonic Sciences \(ICFO\)](#) and the [Université Libre de Bruxelles \(ULB\)](#) , it has now been demonstrated that the paradoxical goal of letting as much light in or out while maintaining the wave effectively trapped can be achieved with a periodic array of interpenetrated fibers forming a photonic fiber plate. Photons entering perpendicular to that plate may be trapped in an intermittent chaotic trajectory, leading to an optically ergodic system. The researchers simulated and fabricated such a photonic fiber plate and showed that for a solar cell incorporated on one of the plate surfaces, light absorption is greatly enhanced. The interest in the novel light-guiding mechanism proposed in this work well exceeds photovoltaics and may contribute to many relevant applications in future illumination systems, displays or wearable devices. [\[Full article\]](#)

---

[Pronounced Photovoltaic Response from Multilayered Transition-Metal Dichalcogenides PN-Junctions](#)

Article: published in [Nano Letters](#) by Antonio I. Fernández-Domínguez, Francisco J. García-Vidal, Department of Theoretical Condensed Matter Physics and IFIMAC researchers.



**T**ransition metal dichalcogenides (TMDs) are layered semiconductors with indirect band gaps comparable to Si. These compounds can be grown in large area, while their gap(s) can be tuned by changing their chemical composition or by applying a gate voltage. The experimental evidence collected so far points toward a strong interaction with light, which contrasts with the small photovoltaic efficiencies  $\eta \leq 1\%$  extracted from bulk crystals or exfoliated monolayers. Here, we evaluate the potential of these compounds by studying the photovoltaic response of electrostatically generated PN-junctions composed of approximately 10 atomic layers of MoSe<sub>2</sub> stacked onto the dielectric h-BN. In addition to ideal diode-like response, we find that these junctions can yield, under AM-1.5 illumination, photovoltaic efficiencies  $\eta$  exceeding 14%, with fill factors of  $\sim 70\%$ . Given the available strategies for increasing  $\eta$  such as gap tuning, improving the quality of the electrical contacts, or the fabrication of tandem cells, our study suggests a remarkable potential for photovoltaic applications based on TMDs. [\[Full article\]](#)

---