

Sustainable luminescent solar concentrators based on organic-inorganic hybrids modified by chlorophyll

A. R. Frias^{1,2}, E. Pecoraro³, S. F. H. Correia¹, L. M. G. Minas^{1,4}, A. R. Bastos^{1,2}, S. García-Revilla⁵, R. Balda⁵, S. J. L. Ribeiro³, P. S. André⁴, L. D. Carlos¹, R. A. S. Ferreira¹

Luminescent solar concentrators (LSCs) are luminescent waveguides able to convert sunlight into specific wavelengths which is then guided by total internal reflection to a photovoltaic (PV) device located at its edges, facilitating the urban integration of PV elements. The use of sustainable natural-based organic molecules as luminescent species is still a challenge. In this work, a novel chlorophyll-based LSC with emission properties in the red/NIR spectral region is reported. The chlorophyll molecules were extracted from *Spirulina maxima*, an abundant cyanobacteria, and immobilized in organic-inorganic hybrid matrices. The LSCs were coupled to a Si-based commercial PV device revealing optical and power conversion efficiency values of ~3.70 % and 0.10 %, respectively, illustrating their potential for the development of nature-based LSCs meeting the requirements of reliable, sustainable and competitive energy systems.



1 — Department of Physics and CICECO, Aveiro Institute of Materials, University of Aveiro
2 — Instituto de Telecomunicações, University of Aveiro
3 — UNESP – Institute of Chemistry, São Paulo State University, Brazil
4 — Department of Electric and Computer Engineering and Instituto de Telecomunicações, Instituto Superior Técnico, Universidade de Lisboa
5 — Departamento de Física Aplicada I, Escuela de Ingeniería de Bilbao, Universidad del País Vasco UPV/EHU, Spain and Centro de Física de Materiales CSIC-UPV/EHU and Donostia International Physics Center, San Sebastián, Spain

