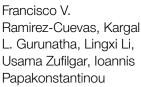
T434: Nanotechnology for energy conversion and storage



congreso nacional de NANOTECNOLOGÍA

Photonic Innovations Lab, Department of Electronic & Electrical Engineering, University College London; London WC1E 7JE, United Kingdom

Francisco V. Ramirez-Cuevas

Center for Energy Transición (CENTRA), Facultad de Ingeniería y Ciencias, Universidad Adolfo Ibáñez; Santiago 7941169, Chile

Kargal L. Gurunatha

Centre for Nano and Material Science (CNMS), JAIN University; Ramanagara Bangalore 562112, India

Sanjayan Sathasivam, Ivan P. Parkin

Materials Chemistry Centre, Department of Chemistry, University College London; London WC1H 0AJ, UK

Manish K. Tiwari

Nanoengineered Systems Laboratory, Department of Mechanical Engineering, University College London; London WC1E 7JE, UK

Flexible self-adaptive thermal radiators using infrared thermochromic antennas

Passive thermoregulation is the ability of living organisms to maintain their internal body temperature against the thermal fluctuations of the surroundings. Imitating this mechanism artificially in elements for buildings, cars, or clothing, could enable significant reductions of the energy demand for heating and cooling systems [1–7]. In this talk, I will introduce our work on infrared thermochromic antennas for self-regulated modulation of radiative heat losses. The antennas are featured by VO2 microcrystals grown by hydrothermal synthesis, which are designed to dramatically switch its thermal emissivity across VO₂'s phase-transition temperature (70° C) [8], at specific regions of the infrared spectrum that can be tuned at will. By embedding the thermochromic antennas into an infrared-transparent polymer, we demonstrate a versatile and cost-effective manufacturing technique for self-adaptive thermal radiators, opening new pathways for large-scale fabrication of passive thermoregulation paints, fabrics, and films.

Acknowledgments

This work was carried out under the framework of the H2020 European Research Council (ERC) Starting Grant IntelGlazing, Grant No. 679891. UZ, MKT and IP would like to thank the Royal Academy of Engineering Frontiers Research Grant FF1920182 for funding. LL and IP would like to thank the UKRI proof of concept grant PolyCool for funding.

References

[1] Lin C. et al. (2022), doi:10.1126/sciadv.abn7359
[2] Fang Z. et al (2021), doi.org/10.1021/acsphotonics.1c00967
[3] Wang S. (2021), doi.org/10.1126/science.abg0291
[4] Tang K. et al. (2021), doi.org/10.1126/science.abf7136
[5] Wei H. et al. (2021), doi.org/10.1002/smll.202100446
[6] Li X. et al. (2020), doi.org/10.1038/s41467-020-19790-x
[7] An Y. et al. (2022), doi.org/10.1016/j.xcrp.2022.101098
[8] Wan C. et al. (2019), doi.org/10.1002/andp.201900188