

Low-Symmetry Materials for Room Temperature Polarization-Sensitive Devices

Cédric Alexander Cordero-Silis

Daniel Vaquero, Teresa López-Carrasco, Harshan Madeshwaran & Marcos H. D. Guimarães
Zernike Institute for Advanced Materials, University of Groningen, 9747 AG, The Netherlands
c.a.cordero.silis@rug.nl

Light detectors based on two-dimensional (2D) materials provide unique opportunities for optoelectronic devices due to their low dimensionality and strong light-matter interaction. In particular, low-symmetry van der Waals (vdWs) materials are promising platforms for polarization-sensitive photonic devices.

In this presentation, I will show that the low-symmetry vdWs semiconductor chromium thiophosphate (CrPS_4) exhibits a strong and highly anisotropic optical and optoelectronic response at room temperature. Using linearly polarized reflectivity and scanning photocurrent measurements, we demonstrate pronounced linear dichroism arising from the coupling between light polarization and the intrinsic crystal symmetry of CrPS_4 . The optical and optoelectronic response exhibits pronounced linear dichroism in the visible-near-infrared range, with a strong polarization modulation and a sign reversal of the reflectivity dichroism over a narrow energy window at room temperature.

Furthermore, spatially resolved photocurrent measurements reveal a clear dependence of the photoresponse on the crystal structure of the device. Our measurements demonstrate a strong modulation of the photocurrent with enhanced photoresponse along one crystal axis, reflecting the intrinsic anisotropic charge transport in CrPS_4 .

These results highlight CrPS_4 as a promising platform for narrow-band polarized photodetectors and anisotropic photo-transport at room temperature, and demonstrate the potential of low-symmetry vdWs materials for future optoelectronic, spintronic, and magneto-optical devices.

References

[1] Cédric A. Cordero-Silis, Daniel Vaquero, Teresa López-Carrasco, Harshan Madeshwaran & Marcos H.D. Guimarães. Manuscript Submitted.

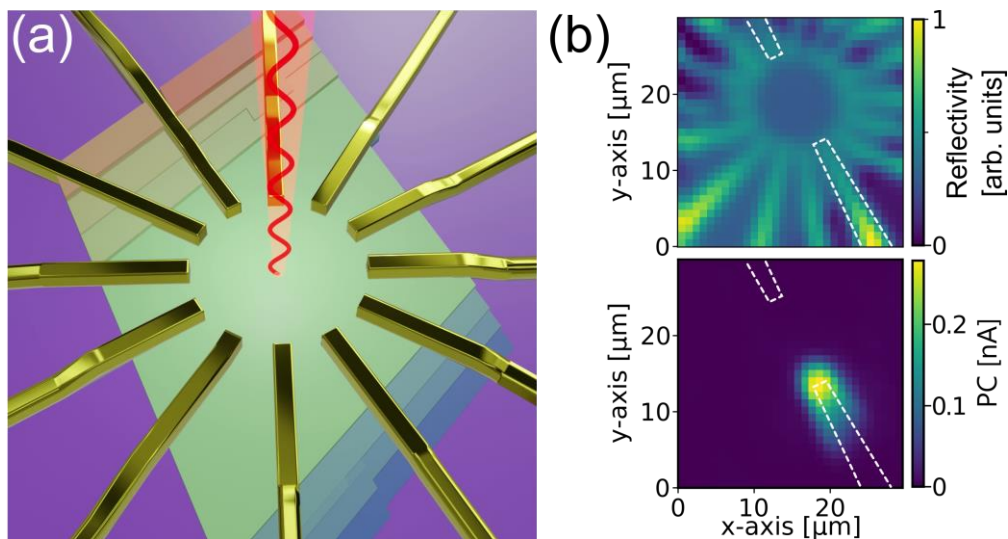


Figure 1: (a) Artistic impression of polarized scanning photocurrent measurements on a CrPS_4 flake with sunflower contact geometry. (b) Spatially resolved reflectivity and photocurrent maps from CrPS_4 device for crystallographic axes photoresponse characterization.