

Supplementary information

Emergent multi-field interaction in a magnetic quasi-two-dimensional WSe₂/SrCoO_{2.5}/2DEG heterojunction

Xinyue Zhang, ‡^a Chenyu Xu, ‡^a Guangyao Sun,^a Kaifeng Li,^b Hao Yang,^b Guozhen Liu,^a Yucheng

Jiang,^a Ju Gao,^a Hao Lu,^{*c} Run Zhao^{*a} and Wei Tian^{*d}

a. School of Physical Science and Technology, Suzhou University of Science and Technology. No. 99

Xuefu Road, Suzhou 215009, China. Email: zr@usts.edu.cn

b. MIIT Key Laboratory of Aerospace Information Materials and Physics, College of Physics, Nanjing

University of Aeronautics and Astronautics, No. 29 Jiangjun Road, Nanjing 211106, China.

c. Institute of Materials Science & Devices, School of Materials Science and Engineering, Suzhou

University of Science and Technology, No. 99 Xuefu Road, Suzhou 215009, China. Email:

d. School of Physical Science and Technology, Center for Energy Conversion Materials & Physics

(CECMP), Soochow University, No. 1 Shizi Street, Suzhou 215006, China.

‡Xinyue Zhang and Chenyu Xu contributed equally to this paper.

* Corresponding authors:

Email: luhaoshaobo@163.com (Hao Lu), zr@usts.edu.cn (Run Zhao) wtian@suda.edu.cn (Wei Tian)

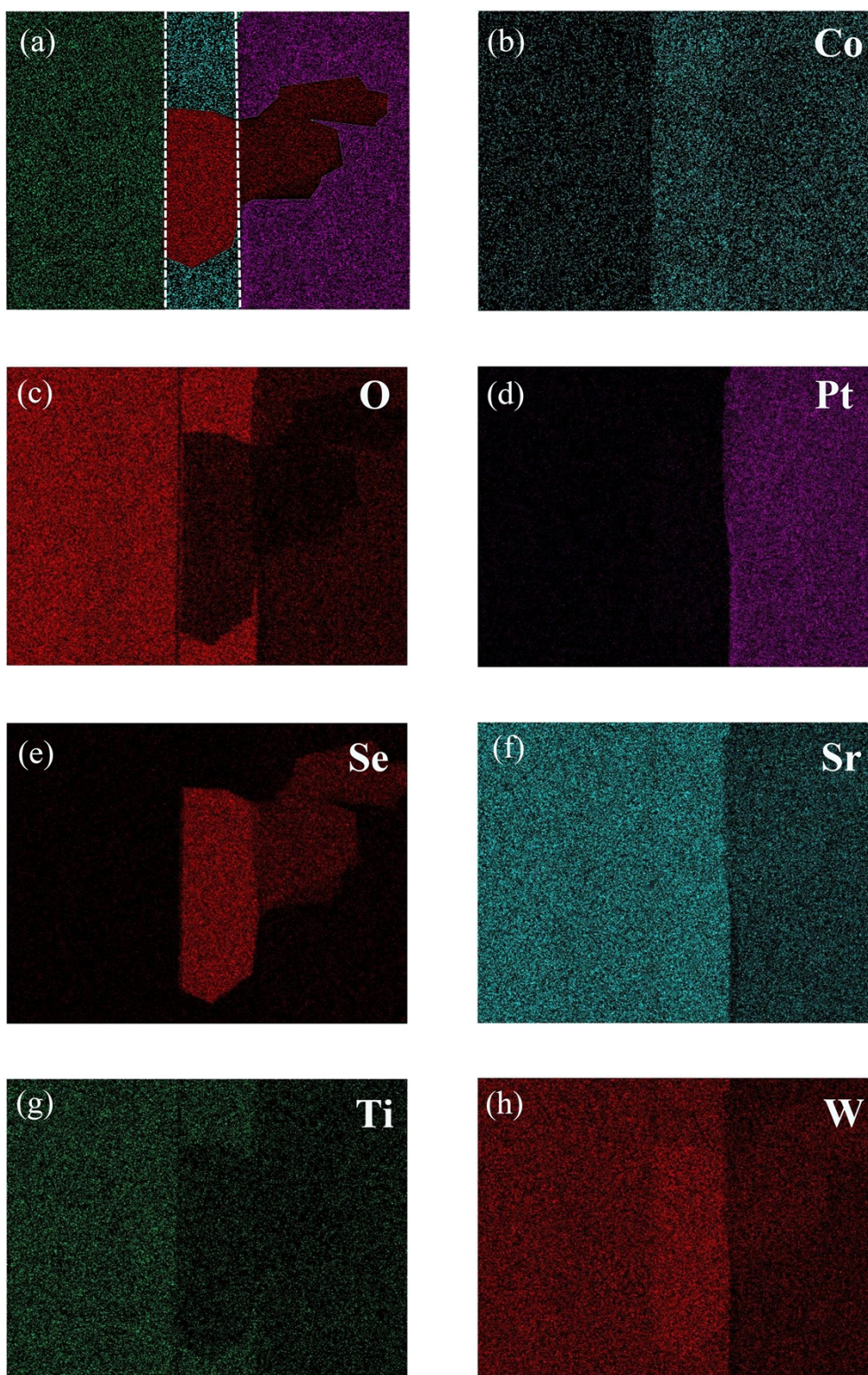


Fig. S1. The separated elemental distribution mapping of EDAX for the device.

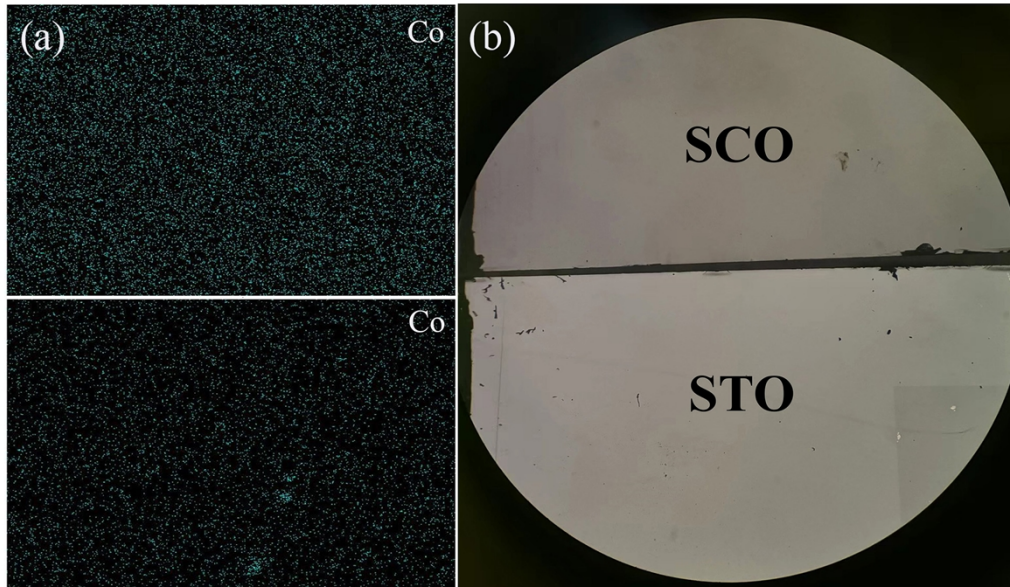


Fig. S2. (a)The elemental Co distribution mapping of EDAX and (b) optical morphology images of the $\text{SrCoO}_{2.5}$ thin film before and after the etching.

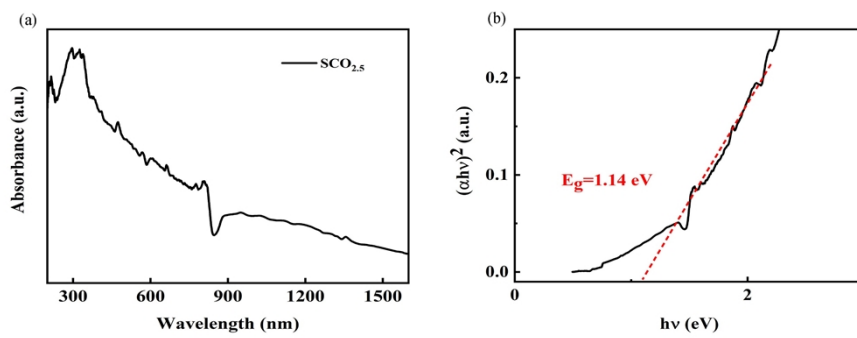


Fig. S3. (a) Absorption spectrum and (b) bandgap fitting of the SrCoO_{2.5} film.

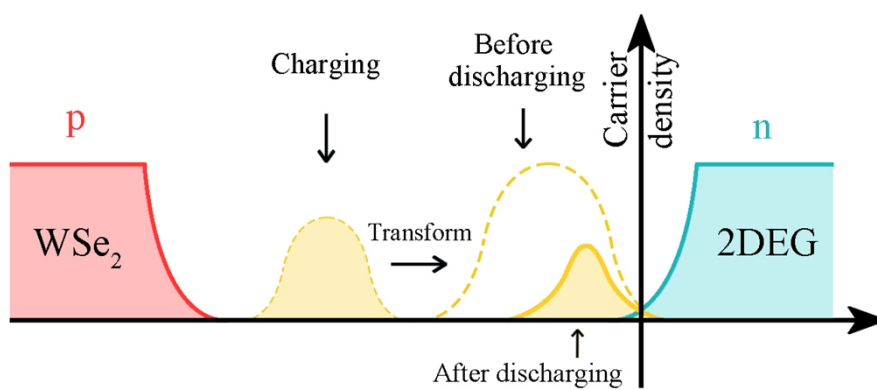


Fig. S4. Schematic of the optical charging and discharging through the storage and release of photocarriers stored in the space charge region.

Table S1 Comparative results in the photosensitivity of three heterojunctions at room temperature.

Parameter	I_{dark} (nA)	$I_{\text{light}} (\times 10^3 \text{ nA})$	Switching ratio	Rectification ratio	Response time (ms)
WSe ₂ /SrCoO _{2.5} /2DEG	-1	2.4	3	10 ³	45
WSe ₂ /TiO ₂ /2DEG	-5	1.5	105	10 ³	60
WSe ₂ /2DEG	-35	0.7	30	10 ²	200