

Supplementary Material:

Fast-Response Micro-Phototransistor Based on MoS₂/ Organic Molecule Heterojunction

Shaista Andleeb ^{1,2,3,*}, Xiaoyu Wang ^{2,4}, Haiyun Dong ², Sreeramulu Valligatla ², Christian Niclaas Saggau ^{1,2,3}, Libo Ma ², Oliver G. Schmidt ^{1,2,3,5} and Feng Zhu ^{6,*}

¹ Material Systems for Nanoelectronics, Chemnitz University of Technology, 09107 Chemnitz, Germany; c.n.saggau@ifw-dresden.de (C.N.S.); oliver.schmidt@main.tu-chemnitz.de (O.G.S.)

² Leibniz-Institute für Festkörper- und Werkstofforschung Dresden, 01069 Dresden, Germany; xiaoyuwangsci@163.com (X.W.); donghaiyun@iccas.ac.cn (H.D.); srihcu08@gmail.com (S.V.); l.ma@ifw-dresden.de (L.M.)

³ Research Center for Materials, Architectures, and Integration of Nanomembranes (MAIN), Chemnitz University of Technology, 09126 Chemnitz, Germany

⁴ Department of Physics, School of Science, Hainan University, Haikou 570228, China

⁵ School of Science, Dresden University of Technology, 01069 Dresden, Germany

⁶ State Key Laboratory of Polymer Physics and Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, China

* Correspondence: s.andleeb@ifw-dresden.de (S.A.); zhufeng@ciac.ac.cn (F.Z.)

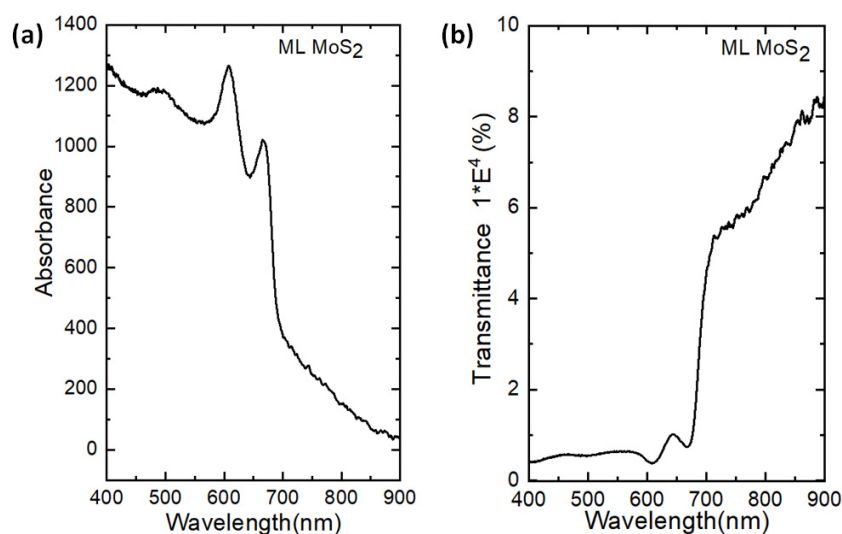


Figure S1. (a) Absorption spectra of ML MoS₂. (b) Transmittance spectra of ML MoS₂.

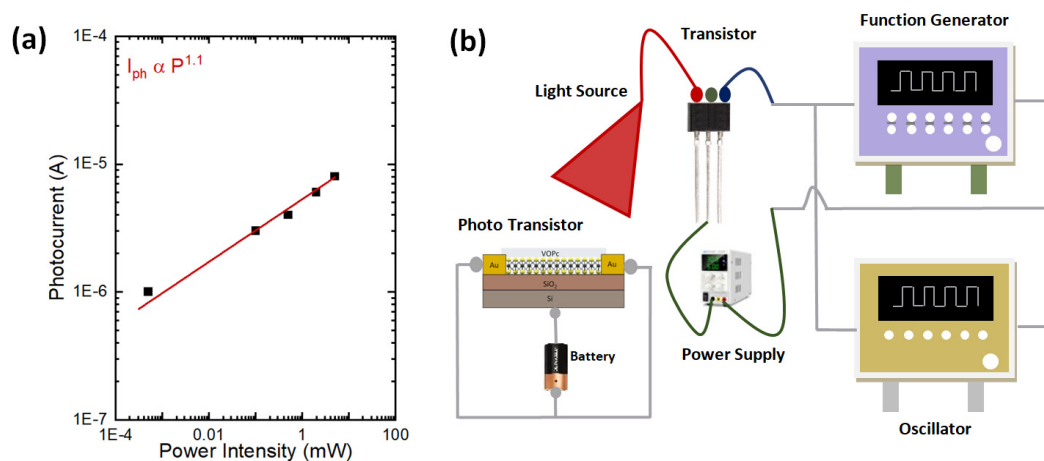


Figure S2. (a) Power intensity-dependent photocurrent measurements. (b) Measurement Setup of the phototransistor.

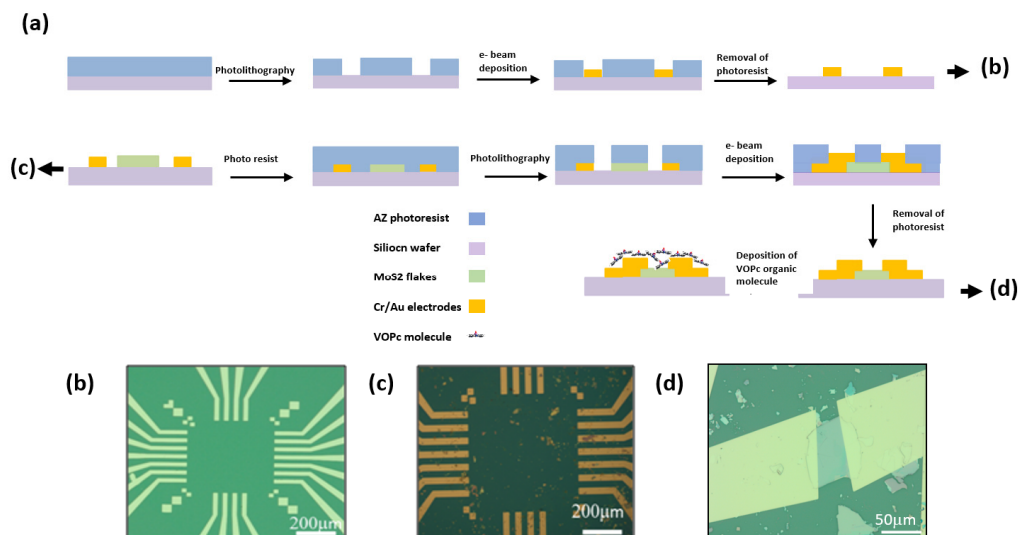


Figure S3. Schematic diagram of the device fabrication process and optical images (a) Schematic diagram of MoS₂ device fabrication process with all steps, see Fig. S3. (b) Optical image of device Cr/Au electrodes, see Fig. S3. (c) Optical image of MoS₂ with Cr/Au electrodes, see Fig. S3. (d) Optical image of MoS₂ device.

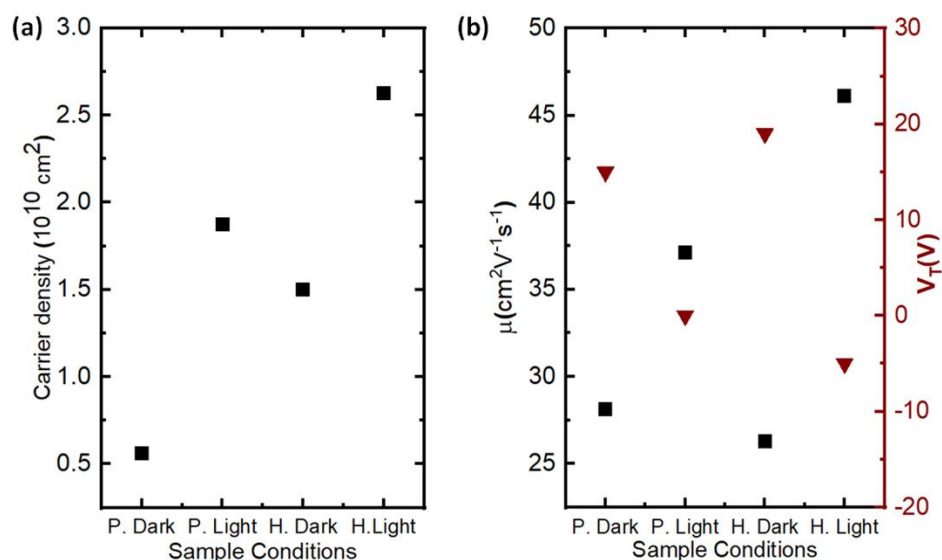


Figure S4. (a) Carrier densities of Pristine (P) MoS₂ and VOPc/MoS₂ heterojunction (H) phototransistor devices in dark and light conditions. (b) Mobilities and the threshold voltages [47] of the Pristine (P) MoS₂ and the VOPc/MoS₂ heterojunction (H) phototransistor devices in dark and light conditions.

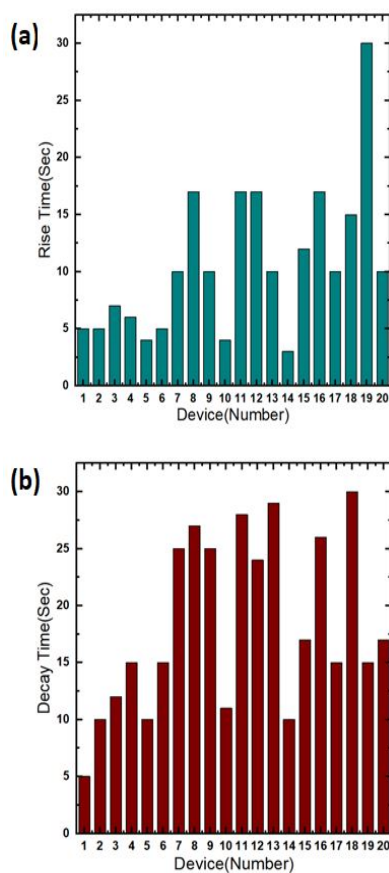


Figure S5. Statistics data of phototransistors (a) Statistics data of photo rise time from 20 MoS₂ phototransistors. (b) Statistics data of photo decay time from 20 MoS₂ phototransistors.

Table S1. State of Art of the response time of VOPc/MoS₂ heterojunction phototransistor.

Photodetectors Structure	Thickness (nm)	Photoresponse (Sec)	Reference
CuPc/MoS ₂	2	5	[51]
Perovskite/Graphene	SL	5.3	[54]
C8-BTBT/Graphene	SL	0.025	[55]
Perovskite/Graphene	SL	0.54	[56]
ZnPc/MoS ₂	SL	0.008	[35]
Our work	230	0.011	This work