INSTITUT FÜR PHOTONIK
Photonics Institute

Solar energy co
van der W
heterostruc

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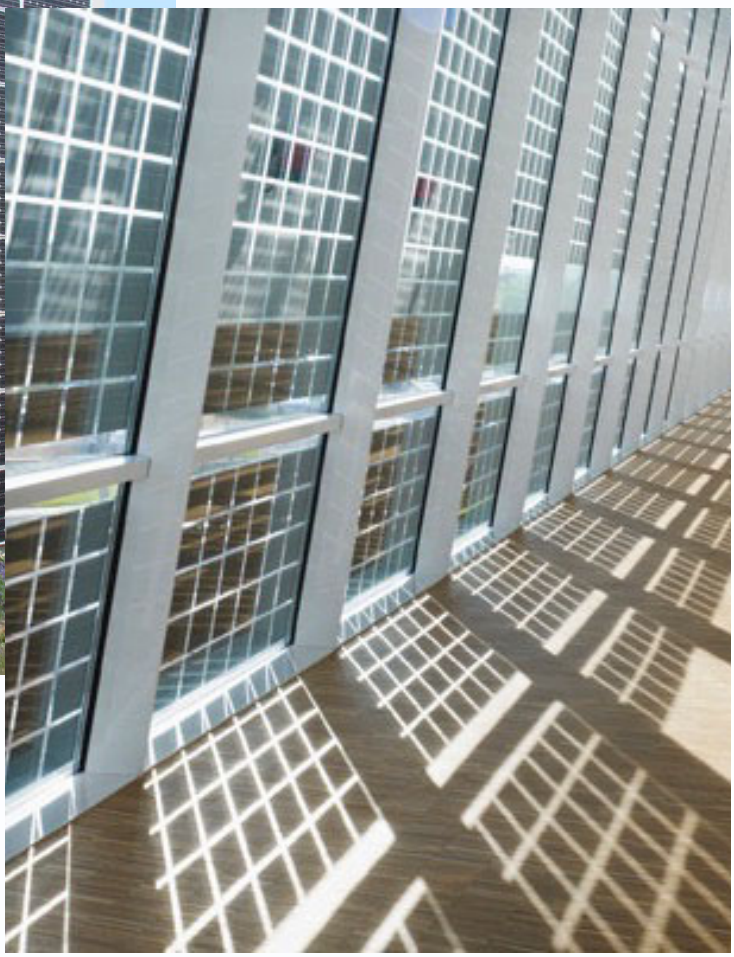
Vienna young Scientists Sy

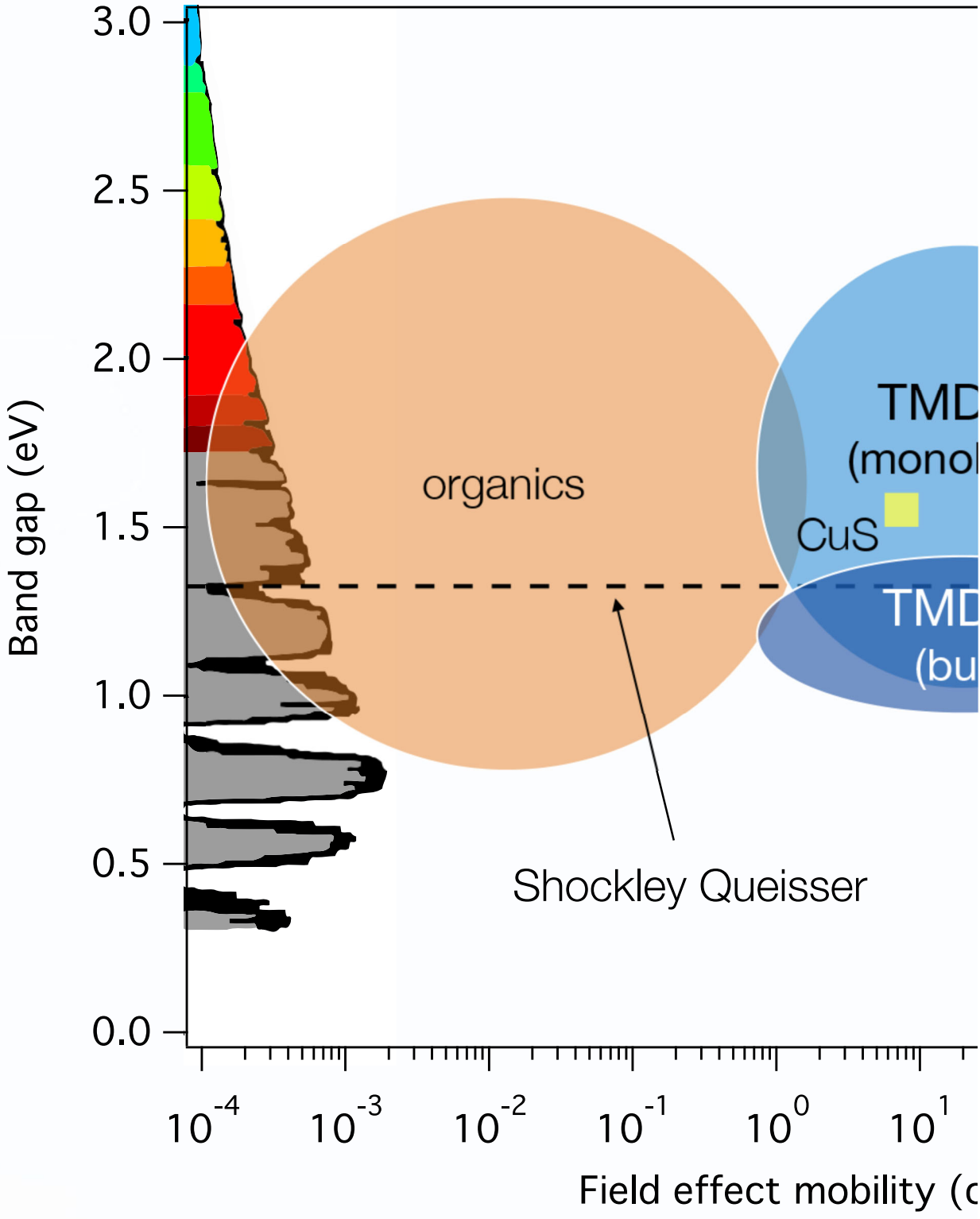
Solar cells today and tomorrow

Solarfassade Boutique Hotel Stadthalle



www.baunetzwissen.de

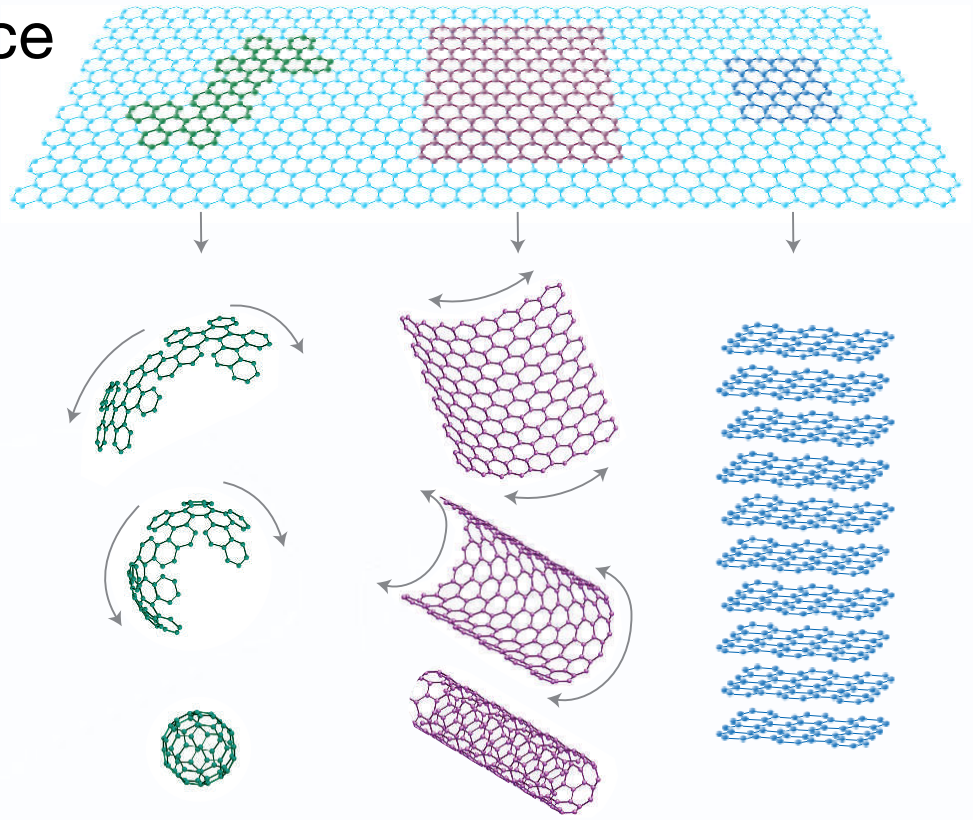
Photovoltaic materials



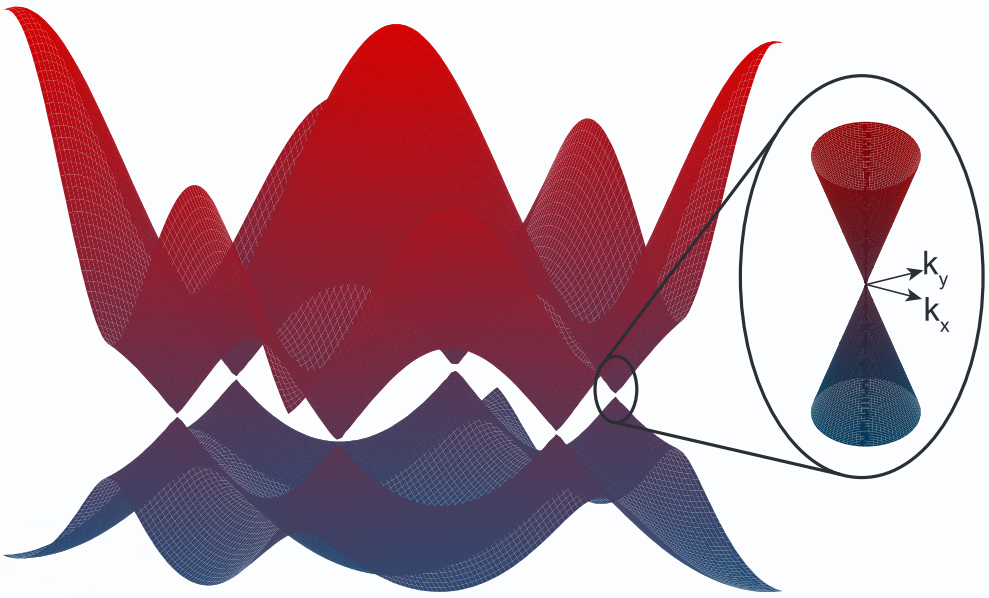
Reproduced from Jariwala et al., ACS Nano (2014)

Graphene

Lattice

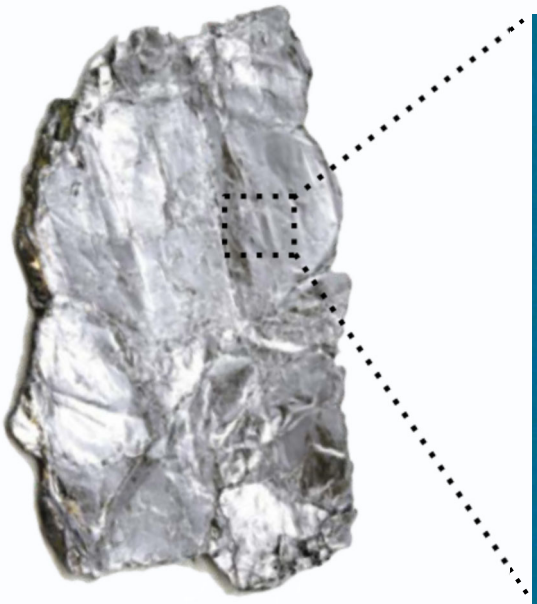


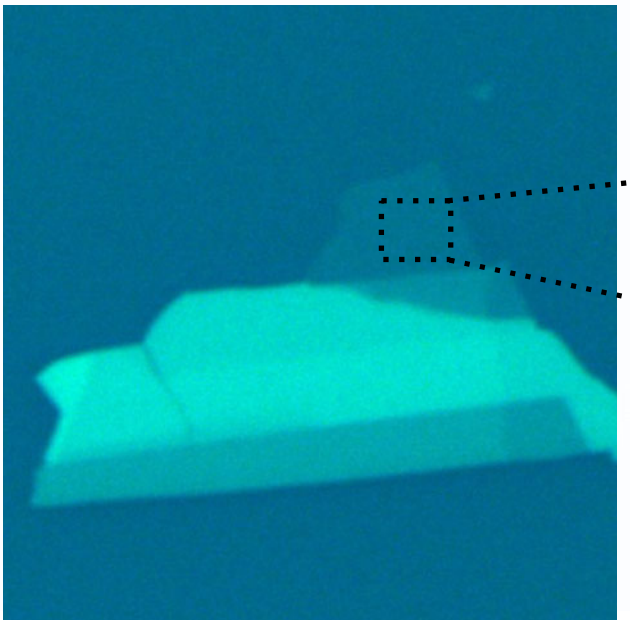
Bandstructure



A.K. Geim and K.S. Novoselov, Nature Materials 6, (2007)

Transition metal dichalcogenide



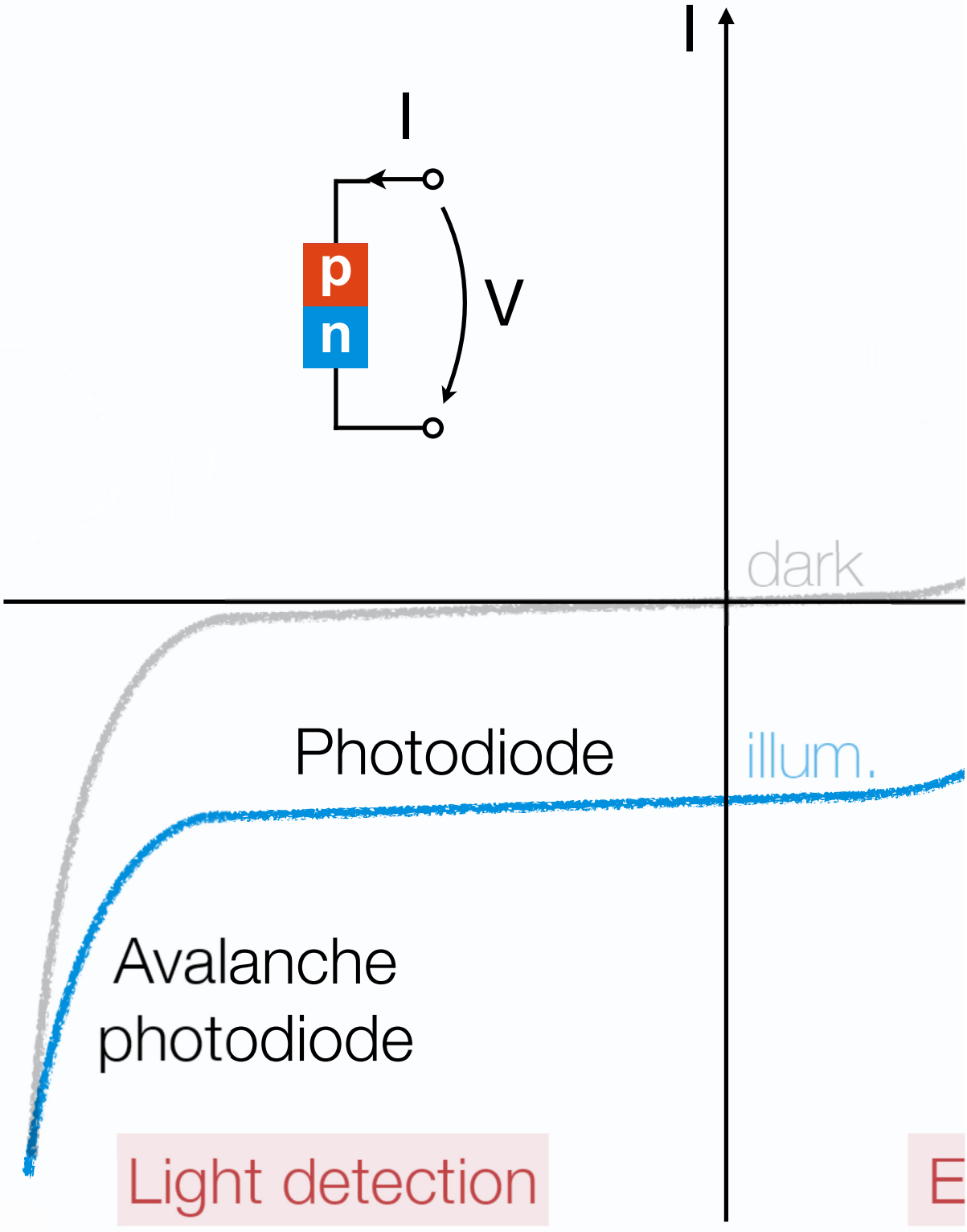


MX_2
M = Transition metal
X = Chalcogen

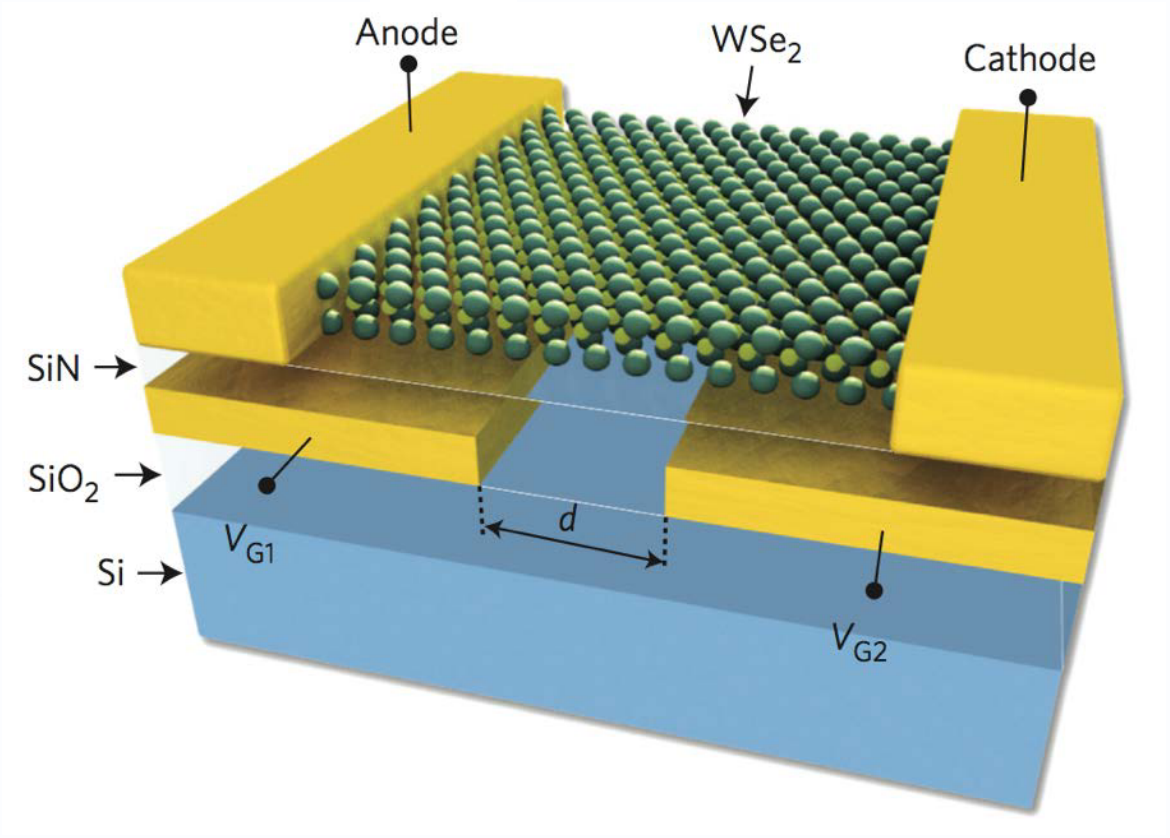
H										
Li	Be									
Na	Mg	3	4	5	6	7	8	9	10	11
K	Ca	Sc	**Ti**	**V**	Cr	Mn	Fe	**Co**	**Ni**	Cu
Rb	Sr	Y	**Zr**	**Nb**	**Mo**	**Tc**	Ru	**Rh**	**Pd**	Ag
Cs	Ba	La - Lu	**Hf**	**Ta**	**W**	**Re**	Os	**Ir**	**Pt**	Au
Fr	Ra	Ac - Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg

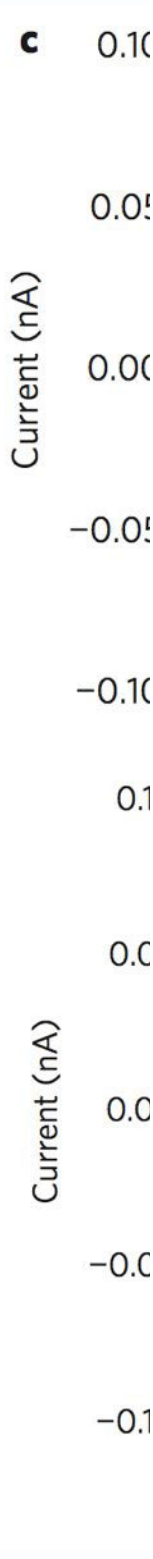
Chhowalla et al., Nature Chem. (2013)

p-n junctions



WSe_2 lateral p-n junction



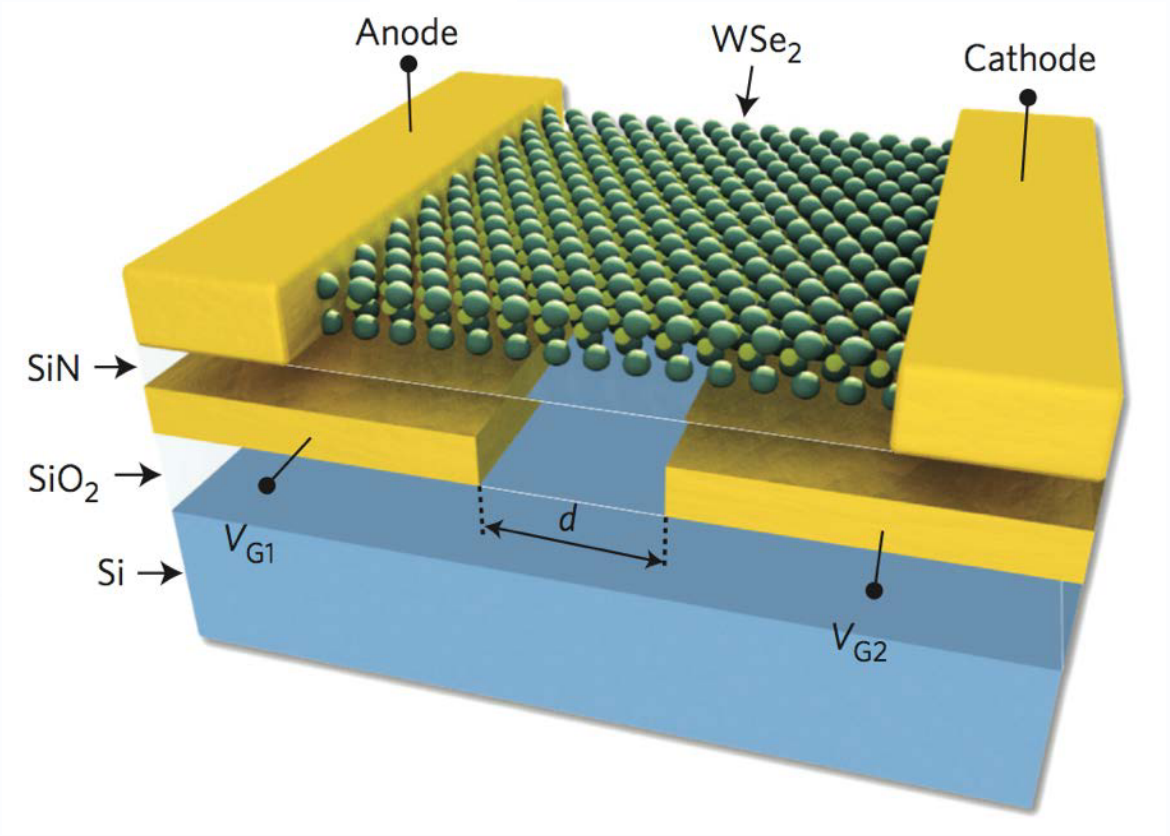


- p-n junction diode

- photodetector
- solar cell
- light emission

A. Pospischil, M.M. Furchi & T. Mueller, Nature Nanotechnology, 9 (2014), als

WSe_2 lateral p-n junction



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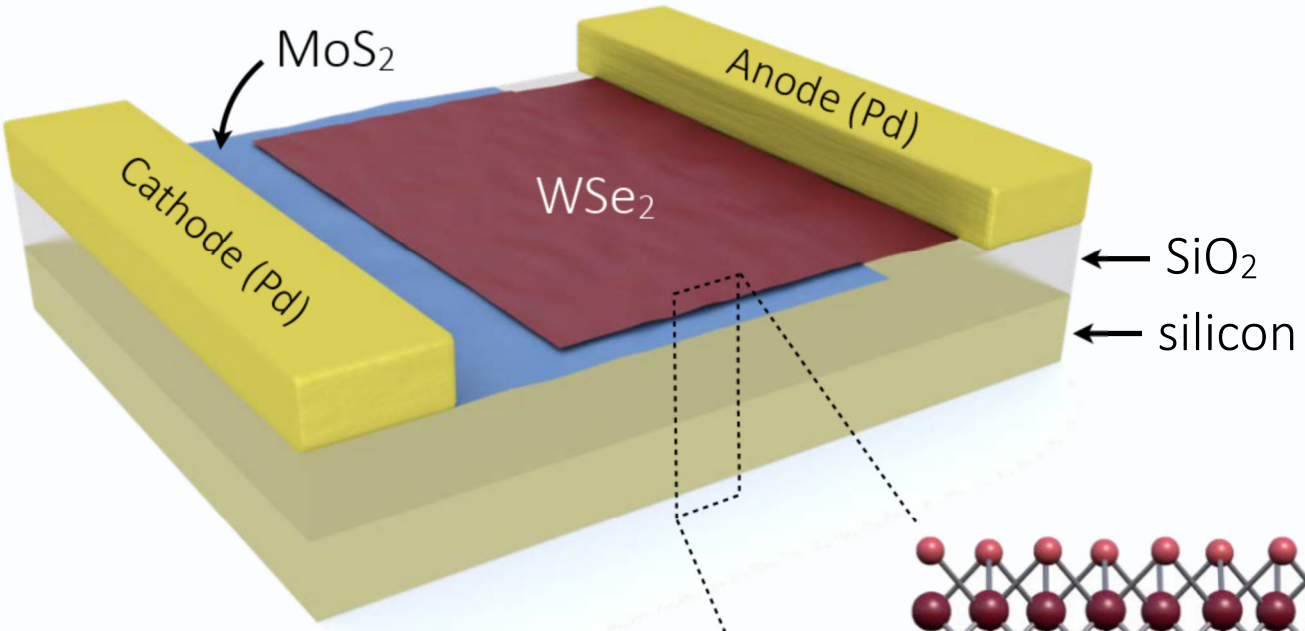
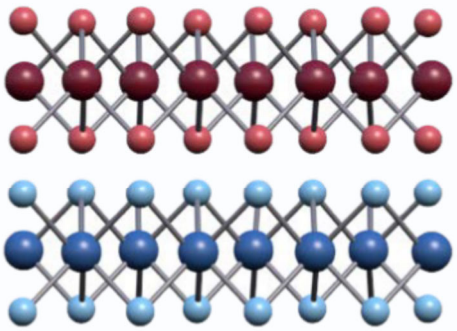
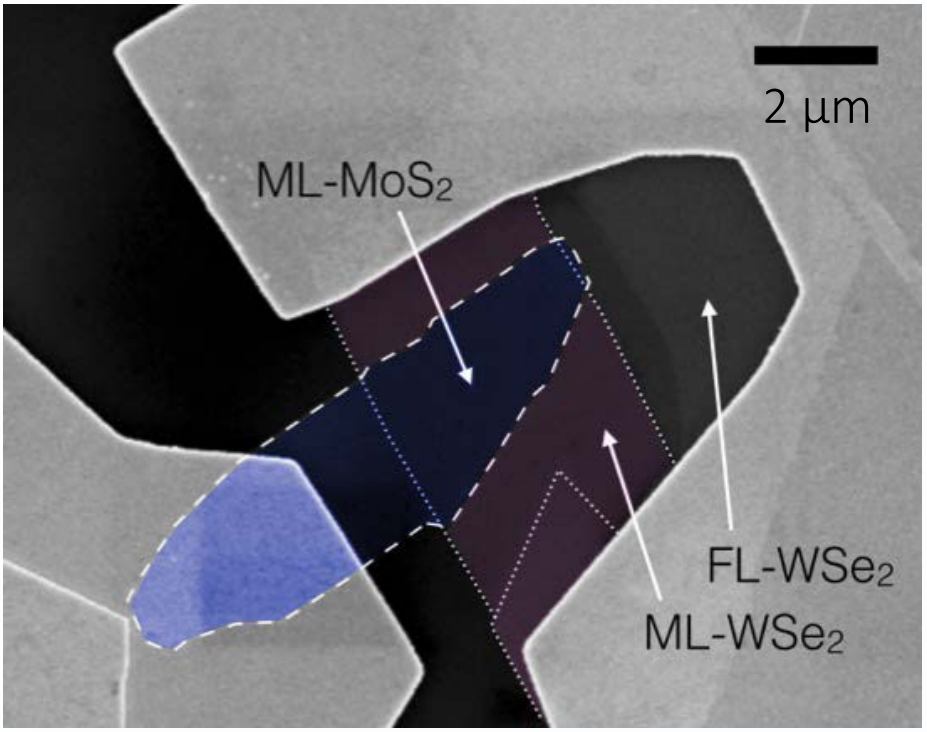
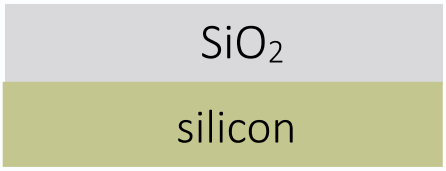
Van der Waals p-n heterojunct



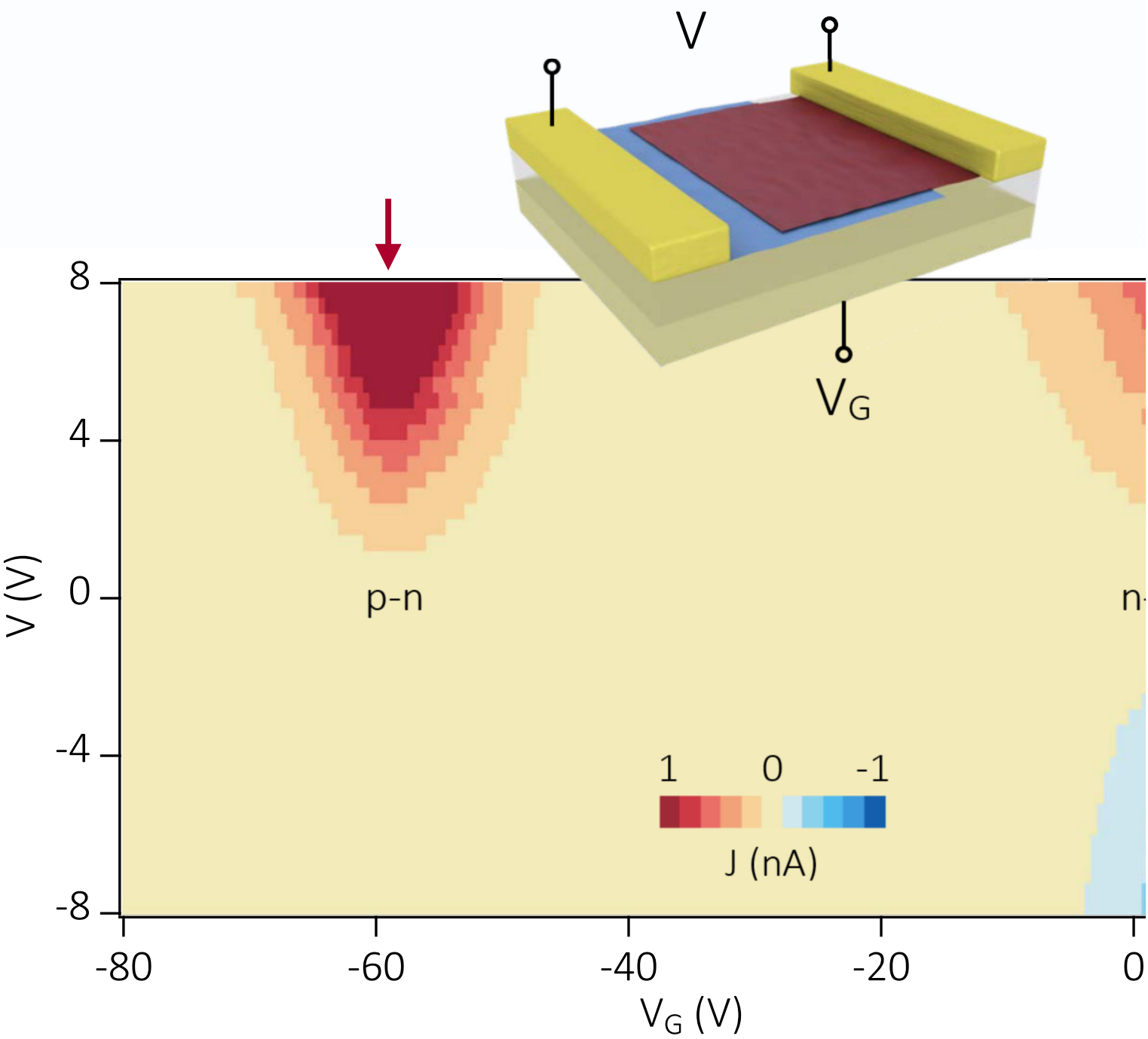






M.M. Furchi et al. Nano Letters 14, 4785 (2014), also: Columbia (Heinz, Hone

Electrical characteristics



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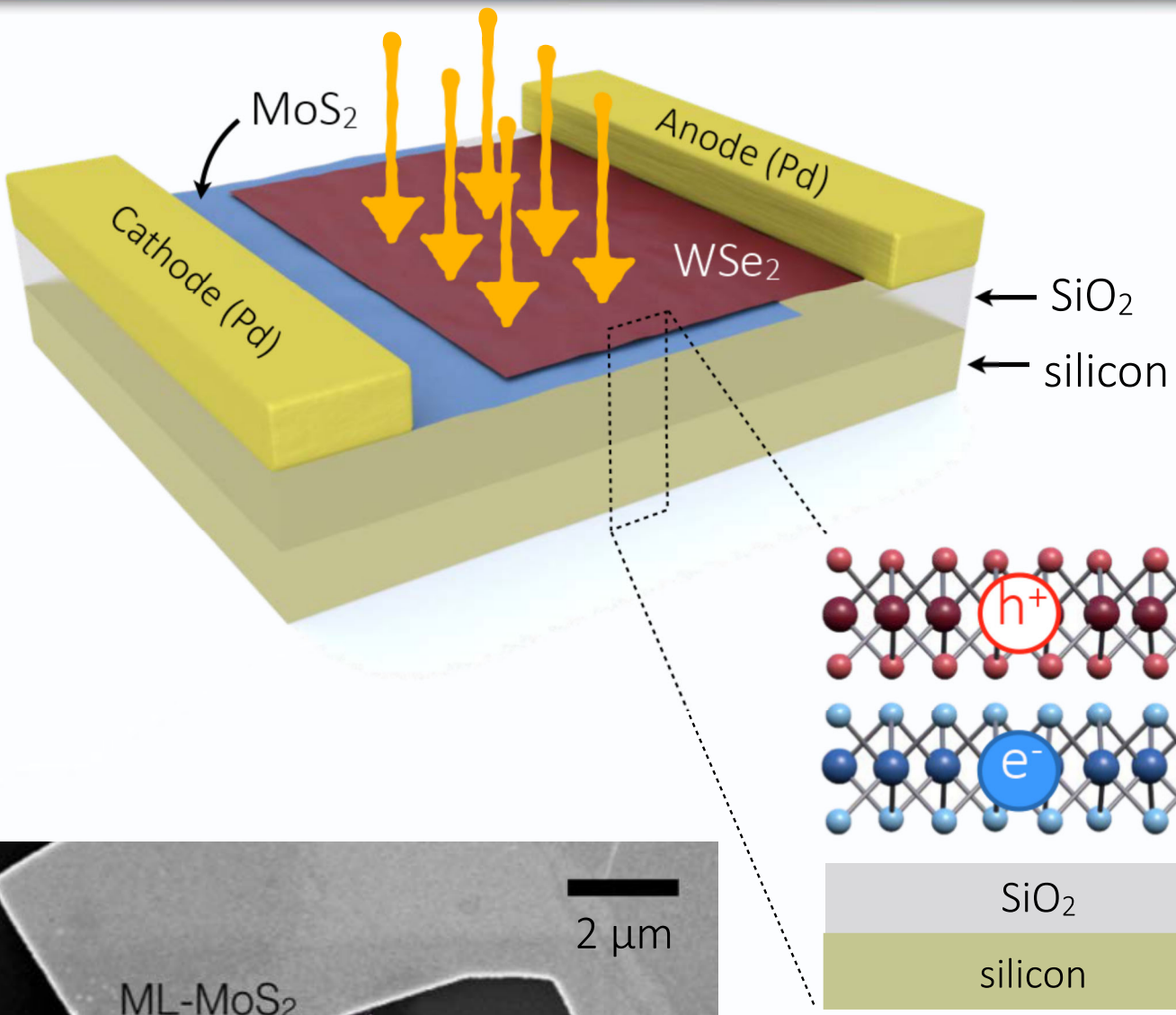
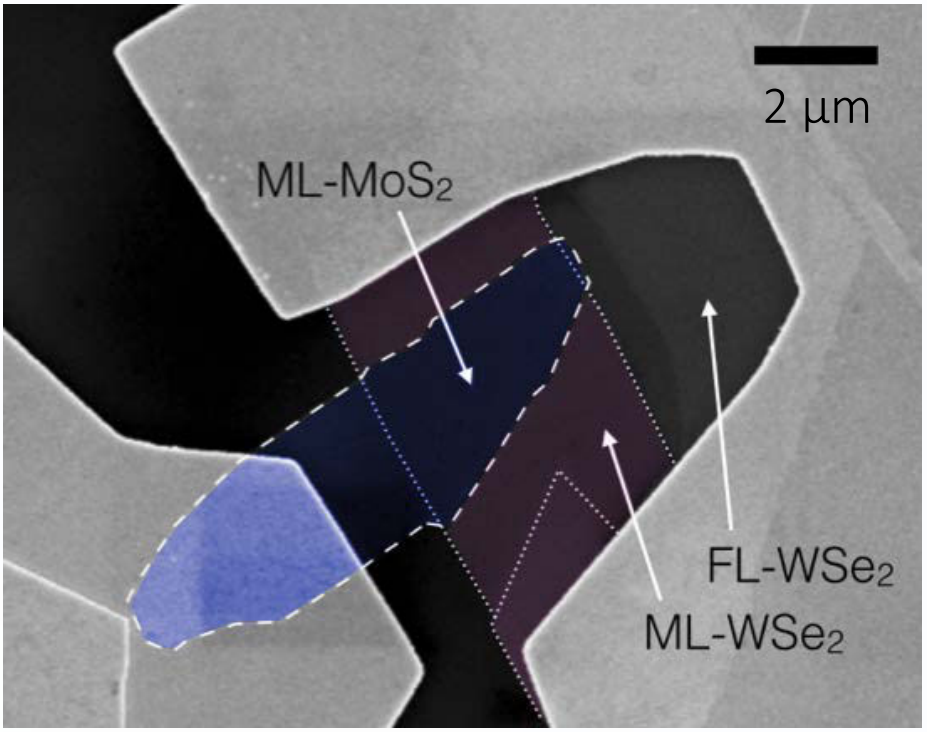
Van der Waals heterojunction





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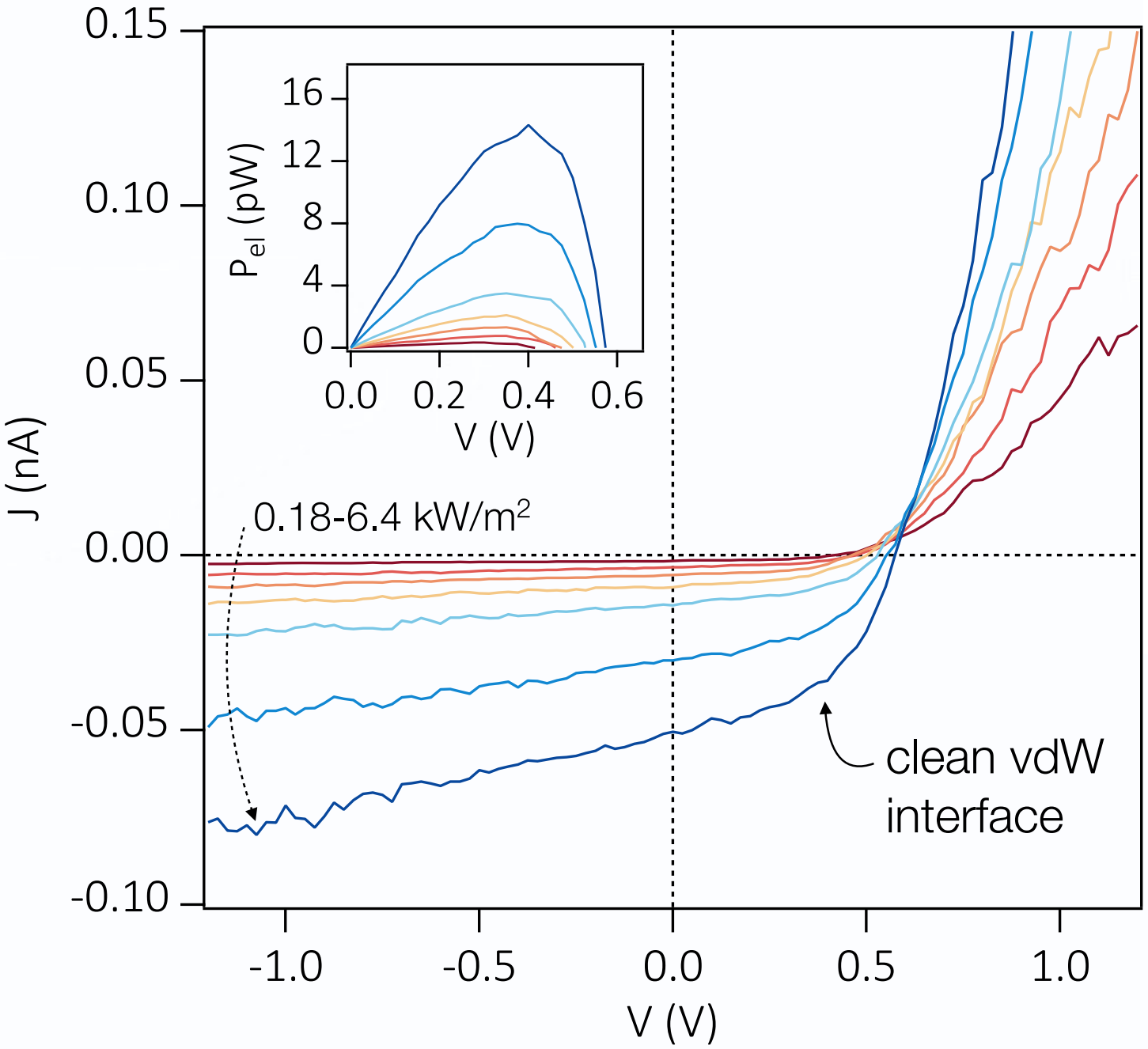
Photovoltaic effect in a vdW h



Summary

- TMDs could be an option for next-gen (low-cost, flexibility, transparency, weig
- Stacks of two (or more) TMDCs can be heterostructures are formed
- Our vdW heterostructure devices can b diodes, photodiodes and solar cells

www.graphenela

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Armin Zechmeister
Thomas Mueller



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GRAPHENE FLAGSHIP