



2D anyagok atomi és elektronszerkezete

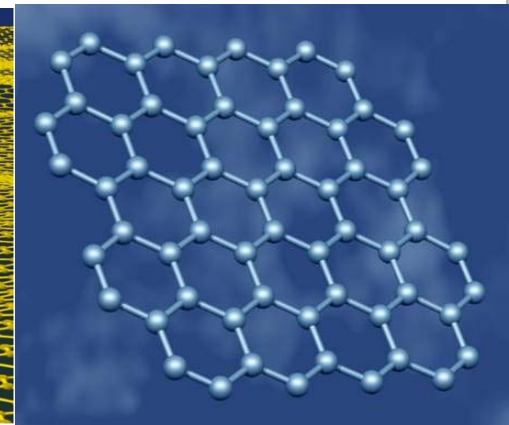
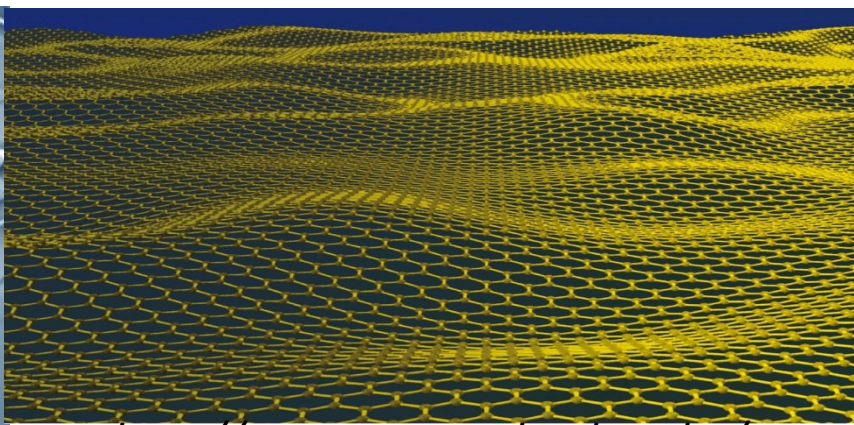


Tapasztó Levente



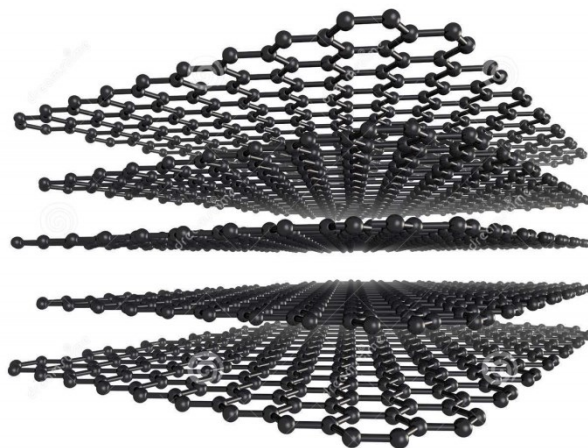
MTA – Energiatudományi Kutatóközpont – MFA

2D Anyagok ERC & Lendület Kutatócsoport

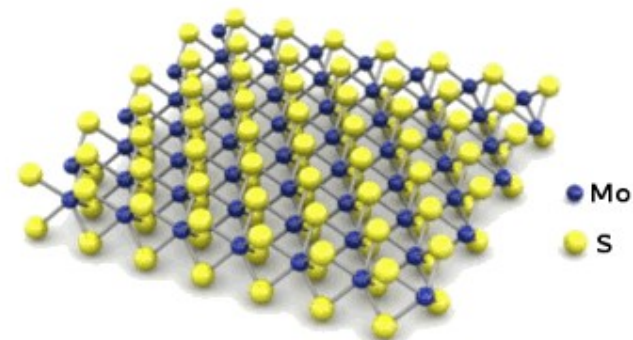
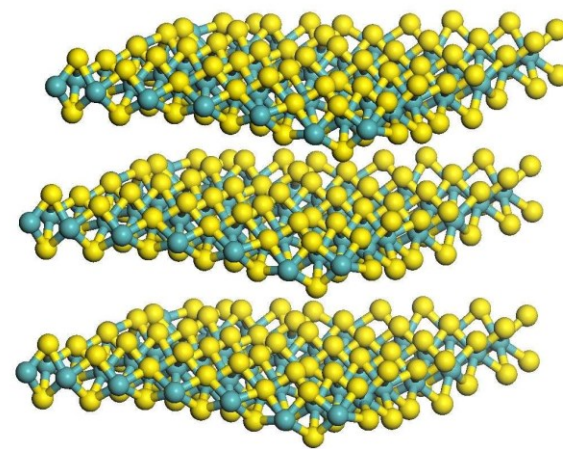
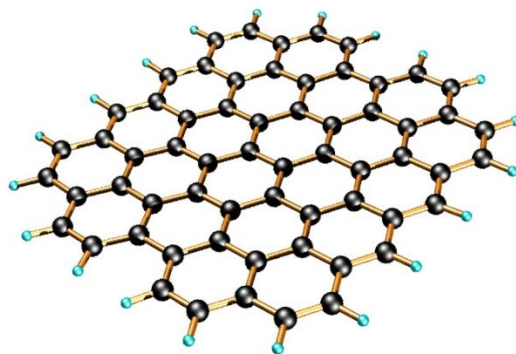


2D Anyagok: túl a Grafénen

3D

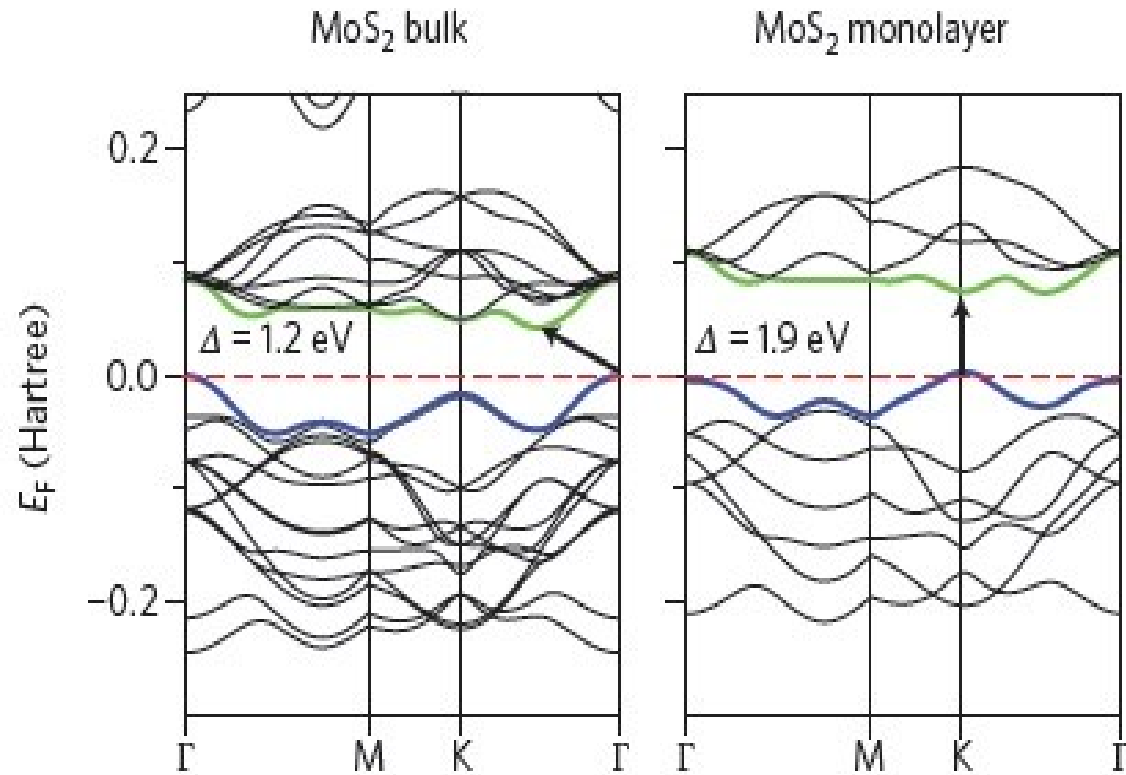
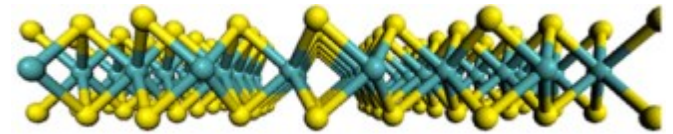


2D

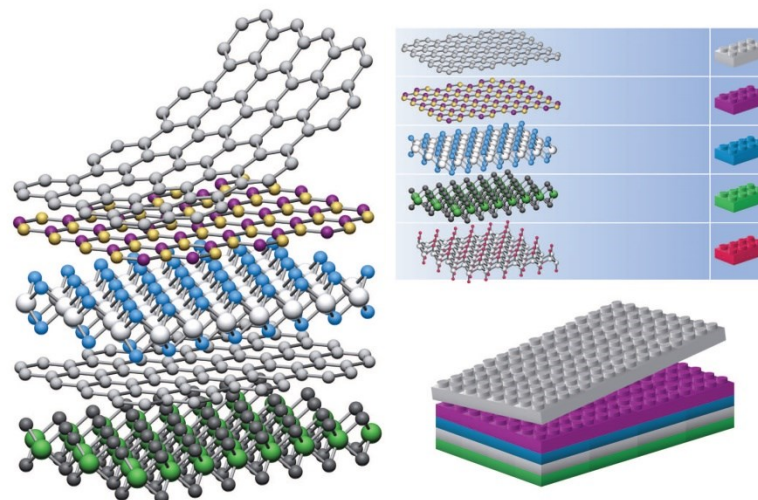
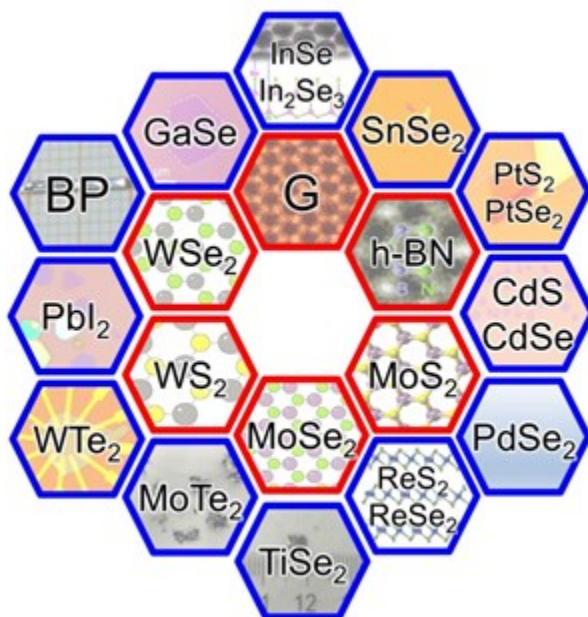




Mi teszi az egyrétegeket érdekessé?



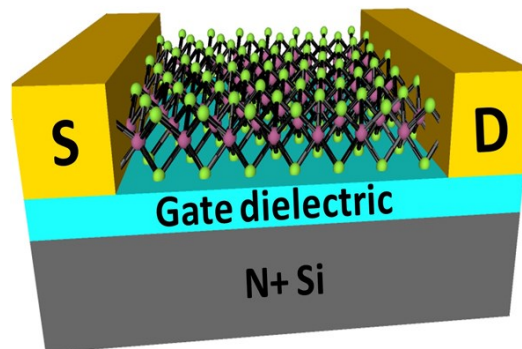
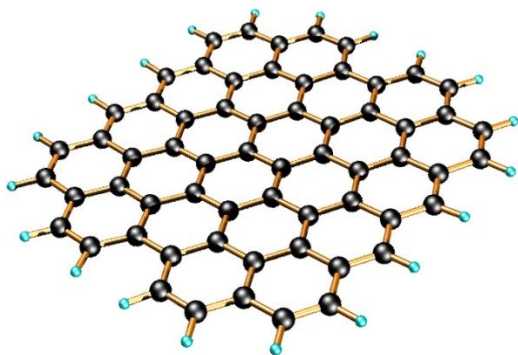
Egy új anyagcsalád születése





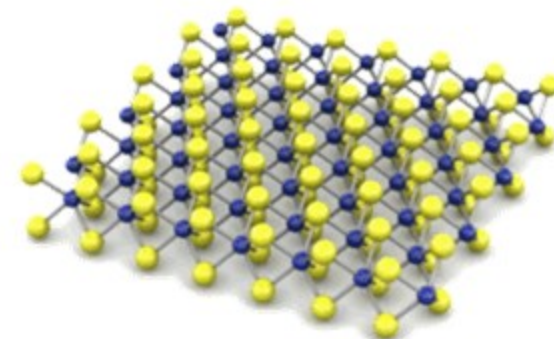
Nanoelektronikai alkalmazások

Grafén



- Nagy töltéshordozó mozgékonyság
- alacsony Ion/Ioff arány

MoS₂



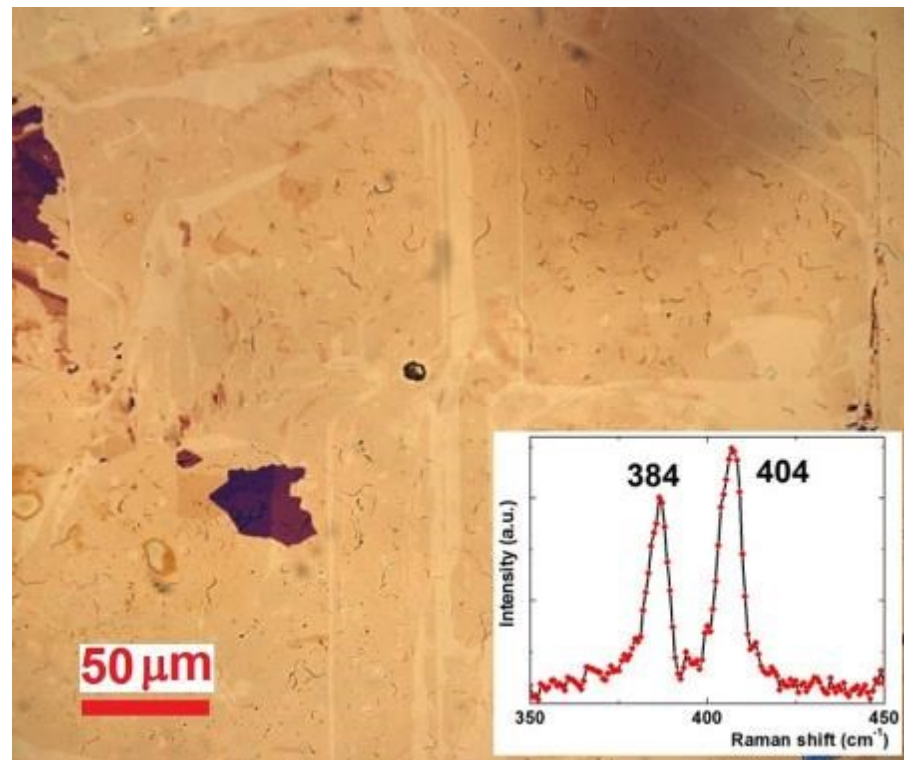
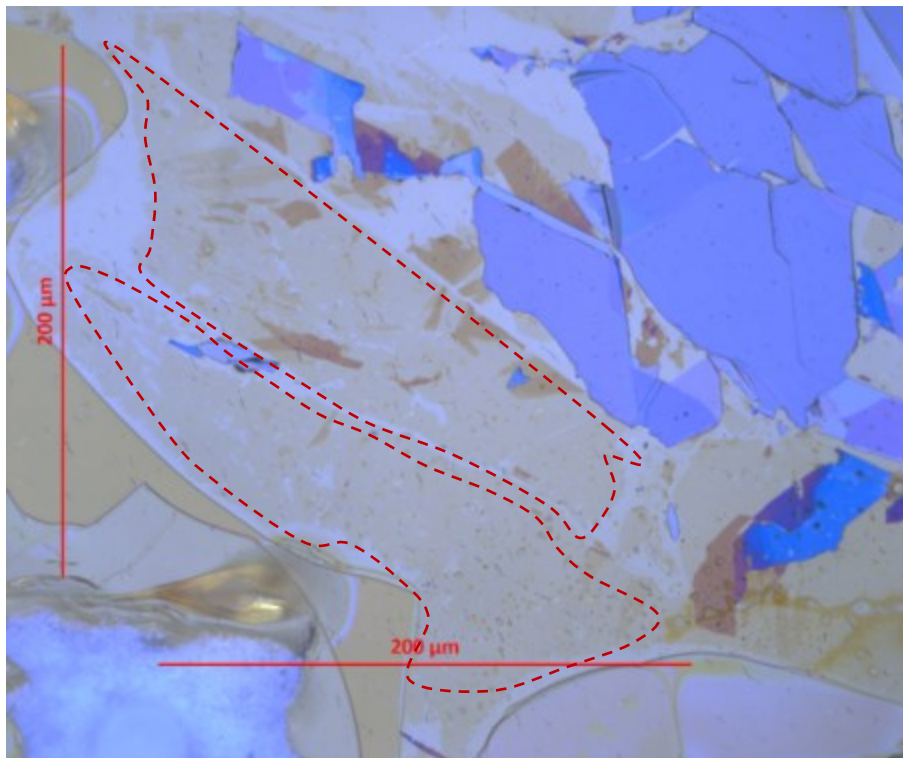
- Alacsony mozgékonyság
- Magas Ion/Ioff arány



2D kristályok előállítása

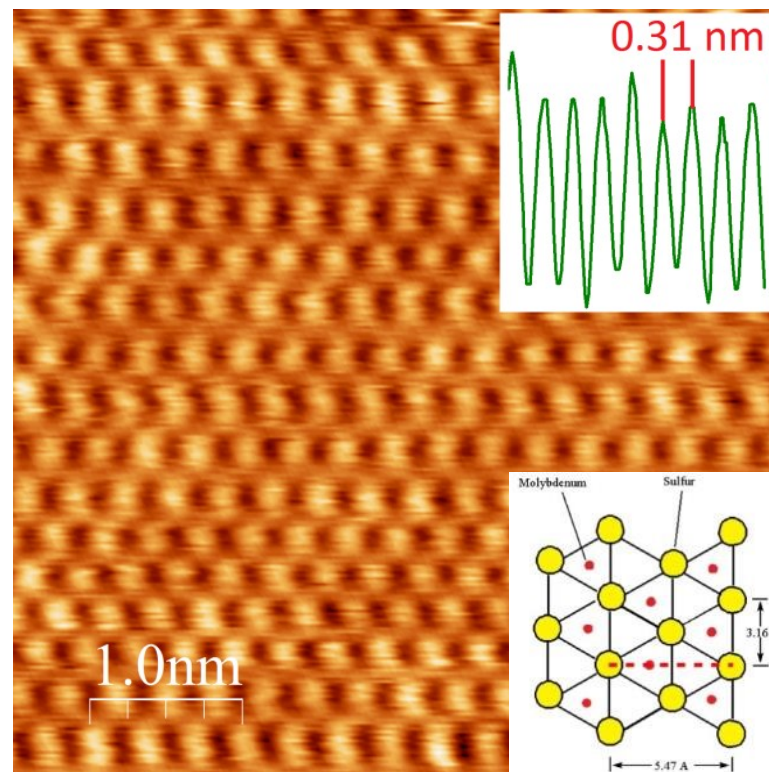
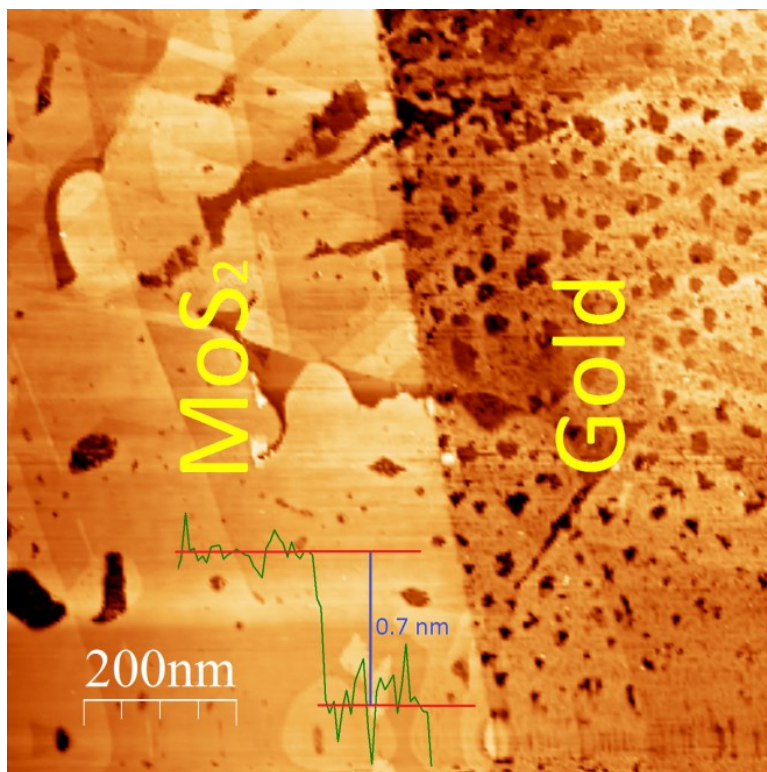


Nagy felületű MoS₂ egyrétegek előállítása Au(111) hordozón



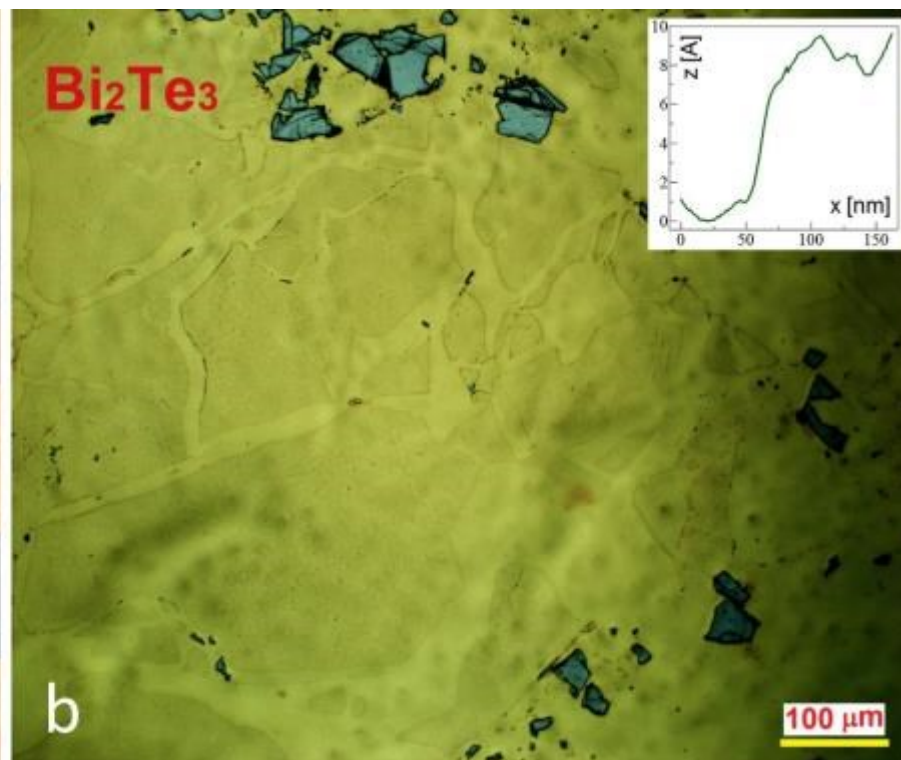
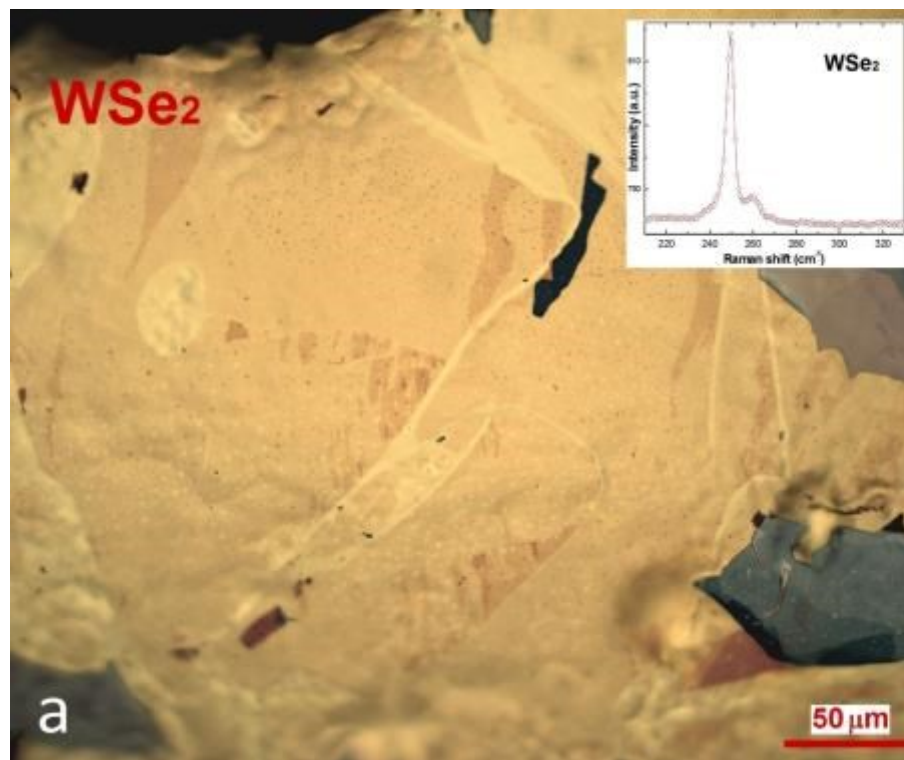
G. Z. Magda, J. Pető, G. Dobrik, C. Hwang, L. P. Biró, L. Tapasztó *Scientific Reports* 5, 14714 (2015)

MoS₂ egyrétegek STM jellemzése





Egyéb 2D kalkogenid egyrétegek előállítása



G. Z. Magda et al. *Scientific Reports* 5, 14714 (2015)

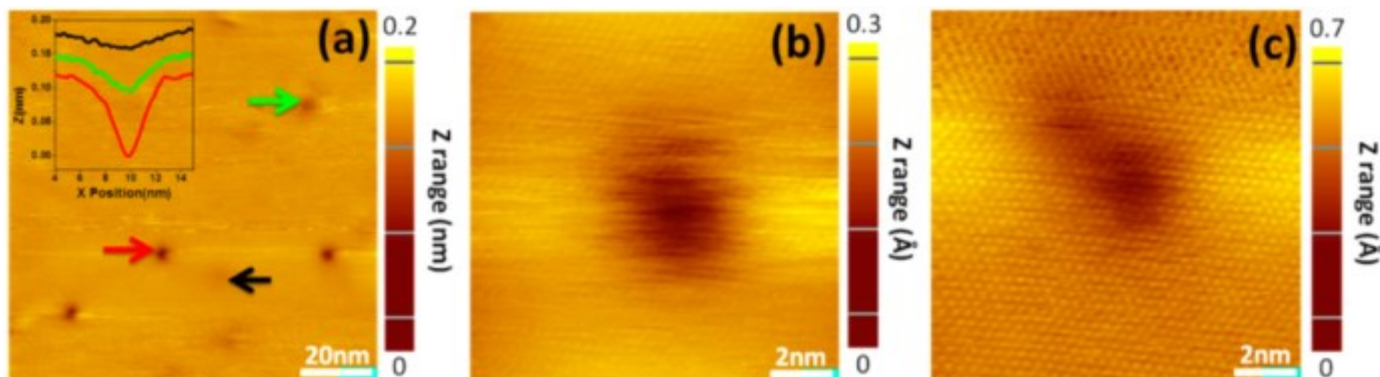


Szerkezeti hibák 2D kristályokban

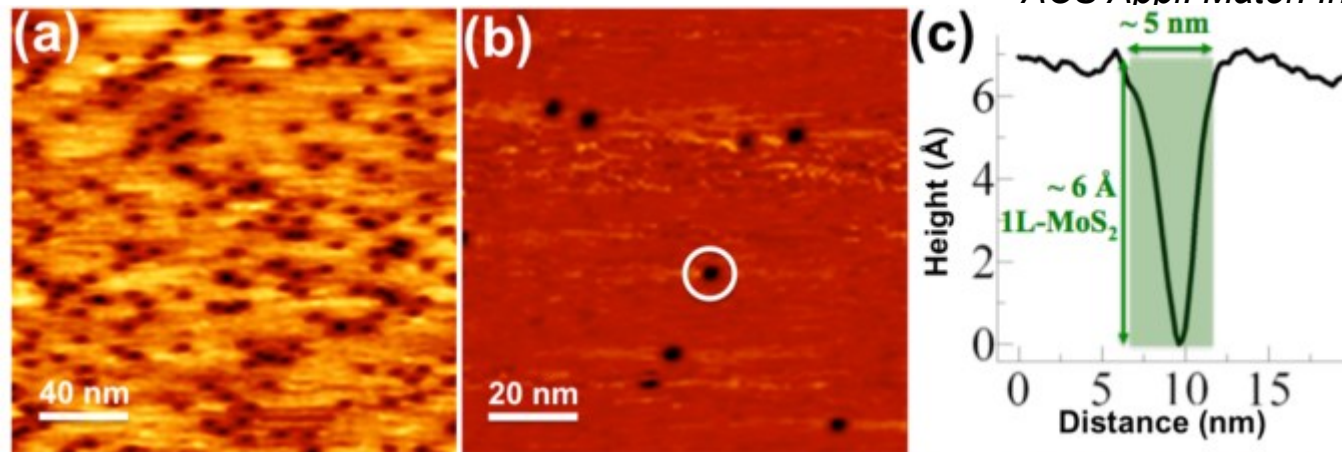


MoS₂ szerkezeti hibáinak STM vizsgálata

Nano Lett. 14, 4628 (2014)

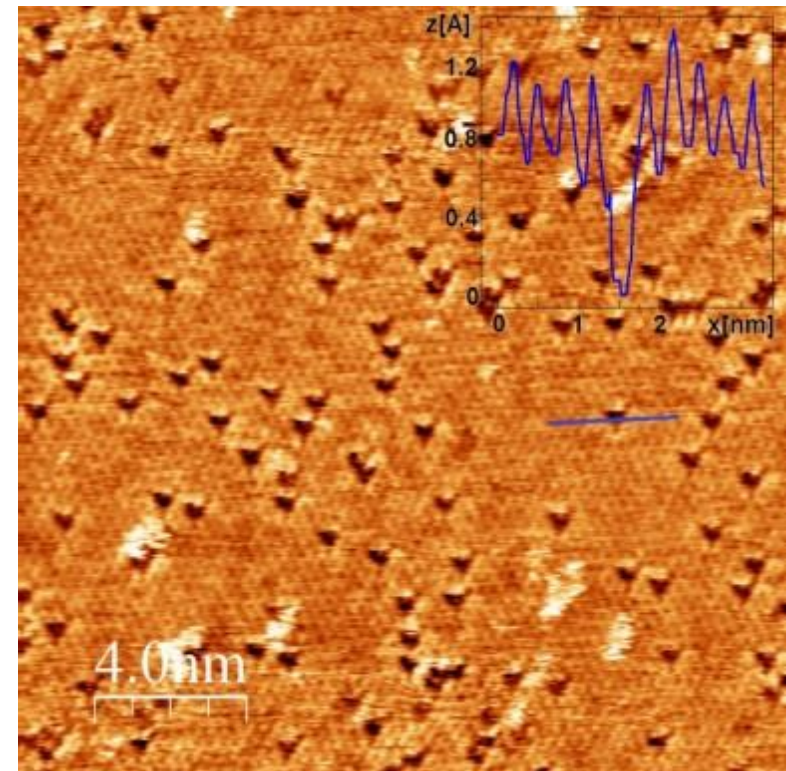
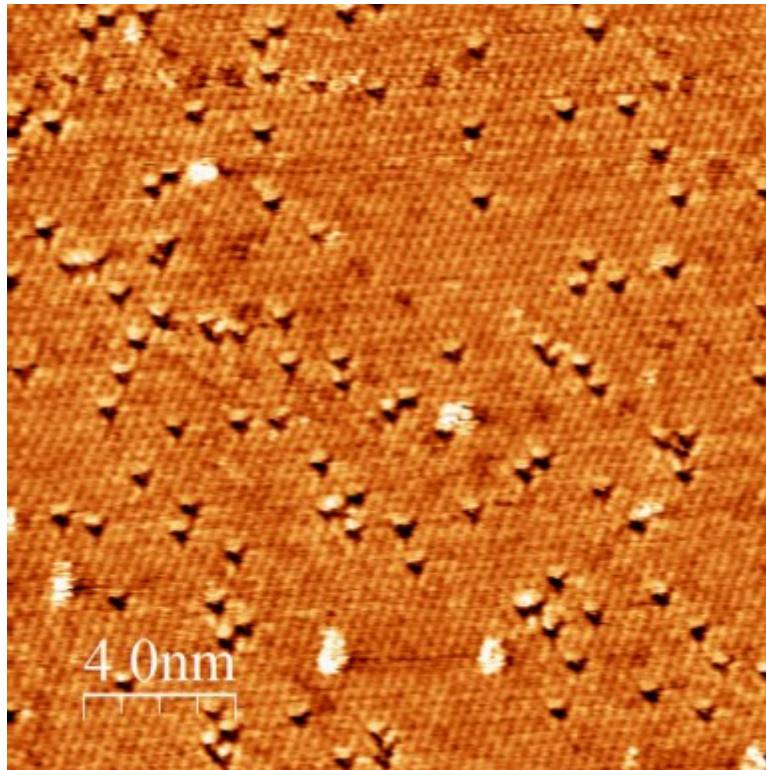


ACS Appl. Mater. Interfaces 7, (2015)

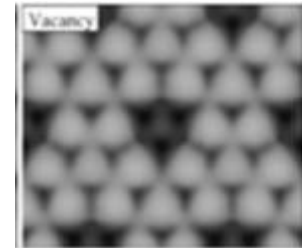
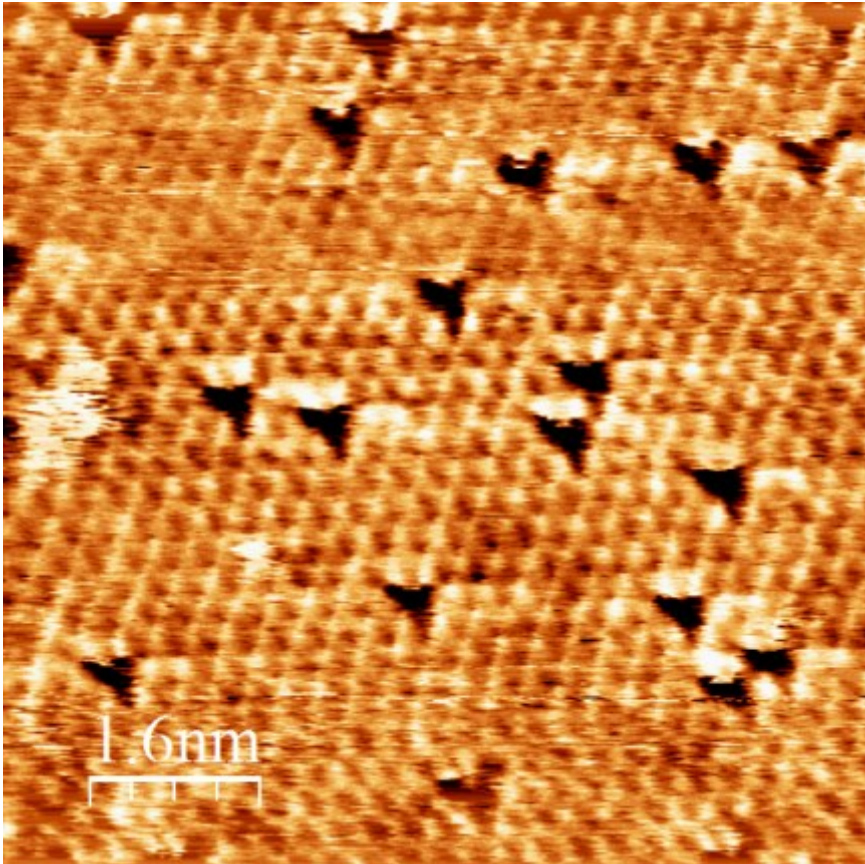




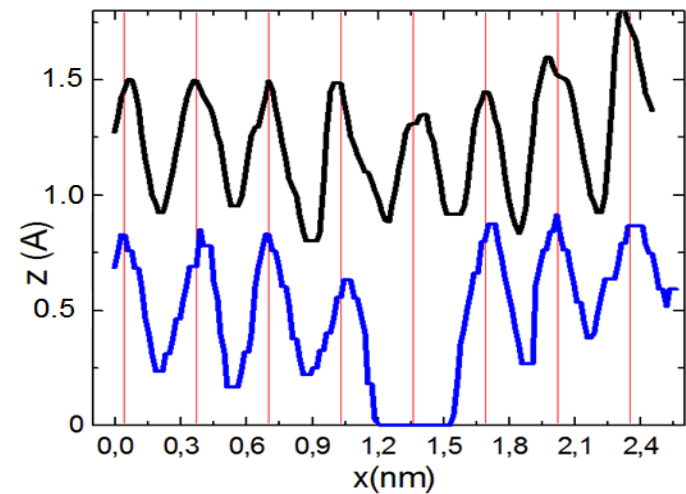
MoS₂ egyrétegek natív szerkezeti hibáinak STM leképezése



MoS₂ egyrétegek natív szerkezeti hibáinak STM leképezése

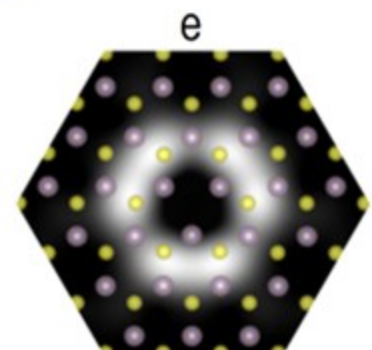
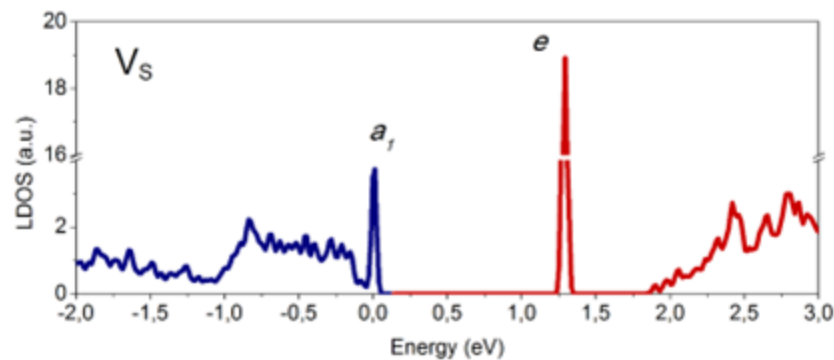
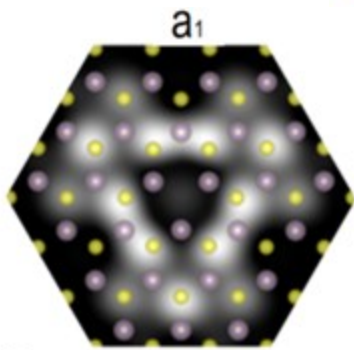
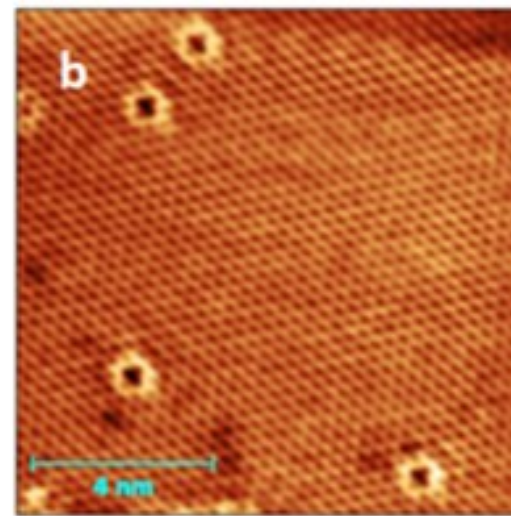
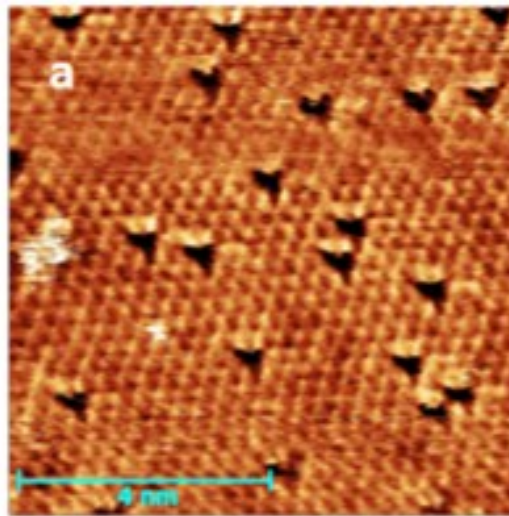


PRL 93, 026802 (2004)



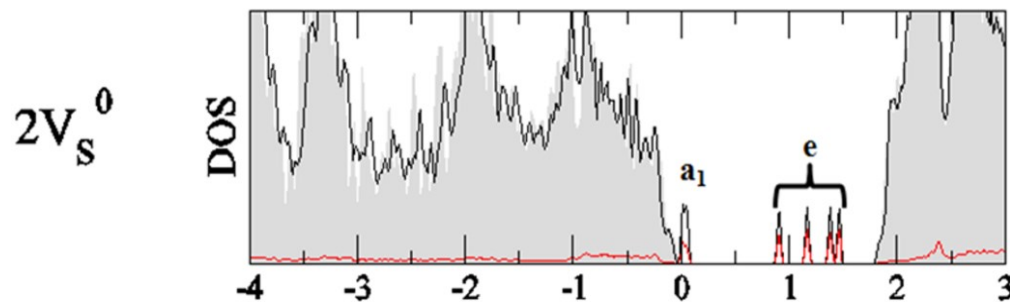
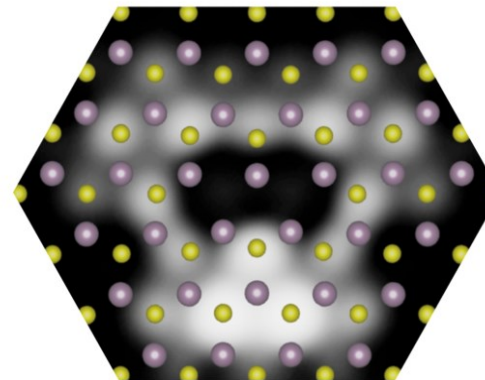
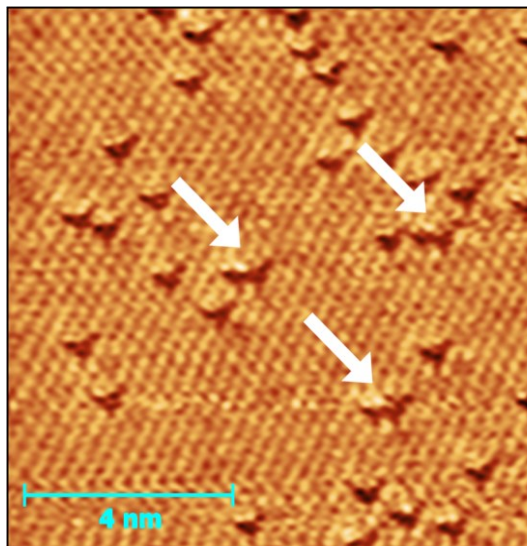
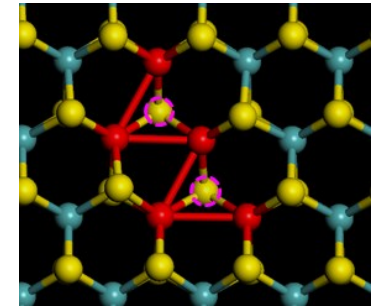
P. Vancsó et al. *Scientific Reports* 6, 29726 (2016)

MoS₂ hibák által indukált elektronállapotok





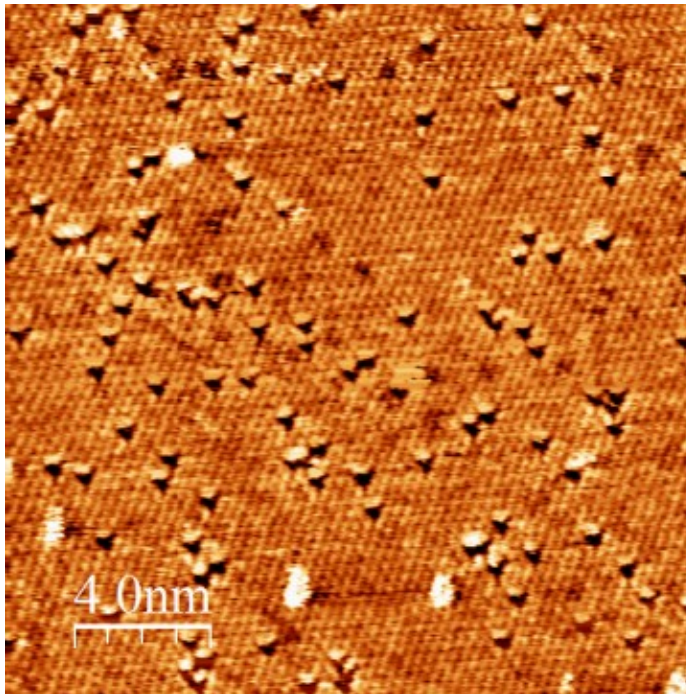
Kén divakanciák MoS₂ egyrétegekben



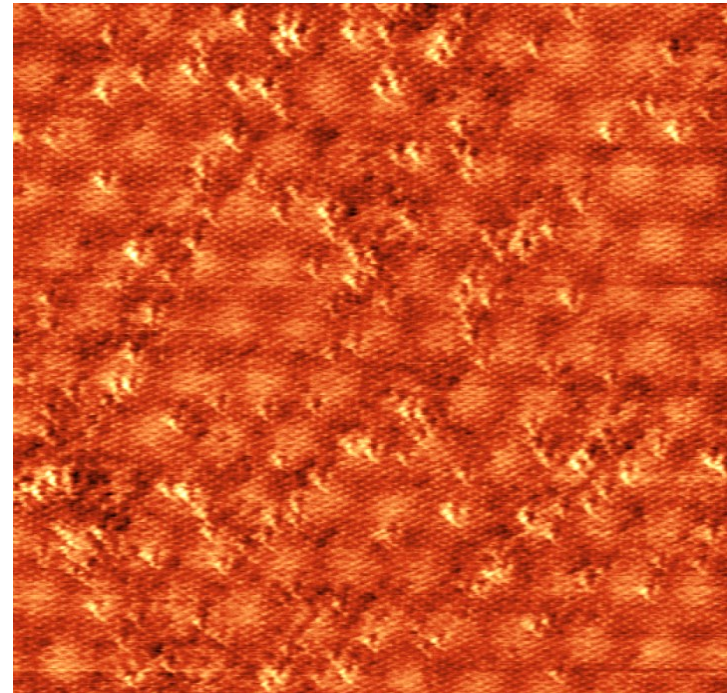


Hibasűrűség 2D TMDC kristályokban

MoS₂

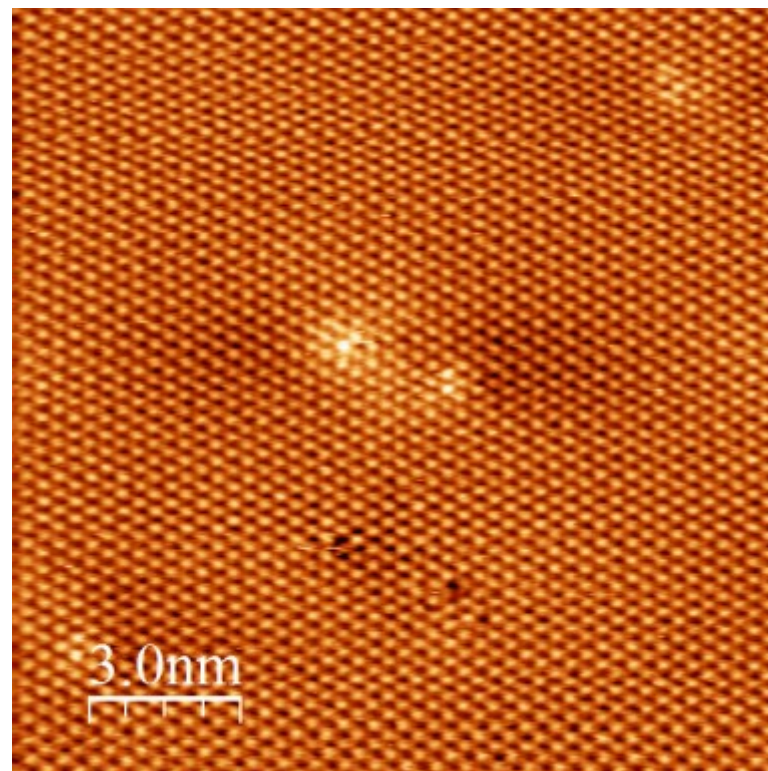
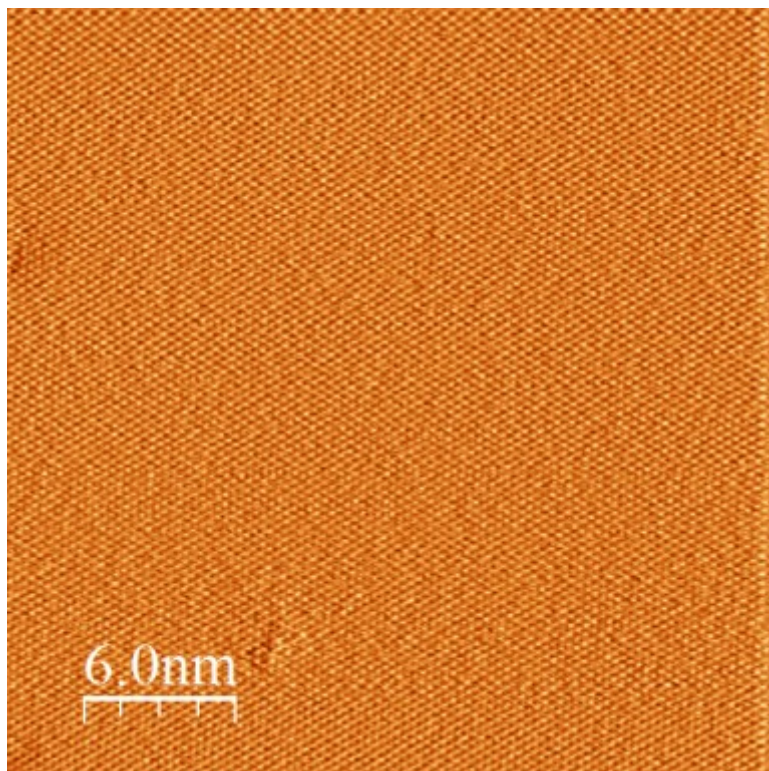


WS₂



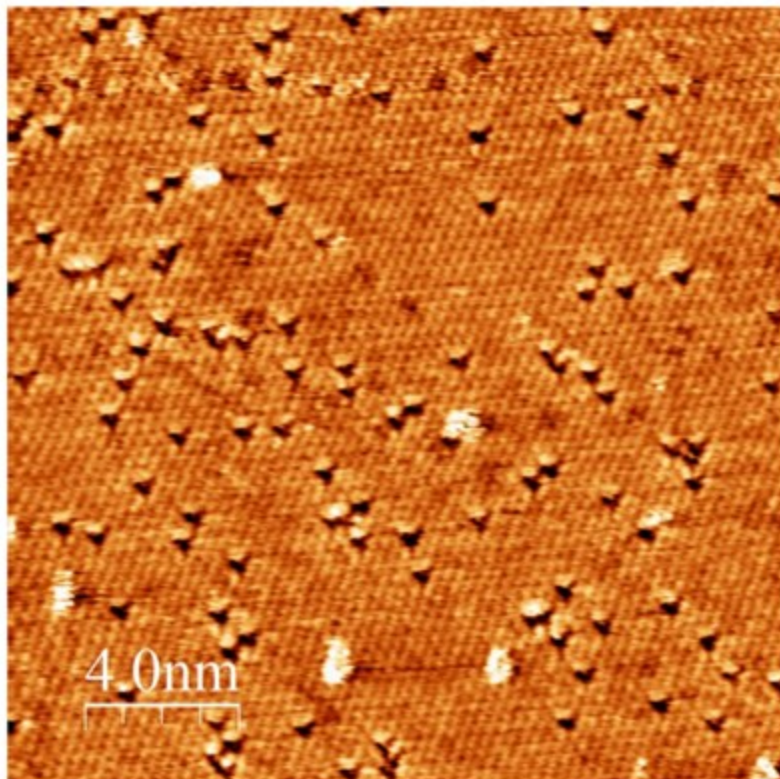


Hibasűrűség 2D TMDC kristályokban





MoS_2



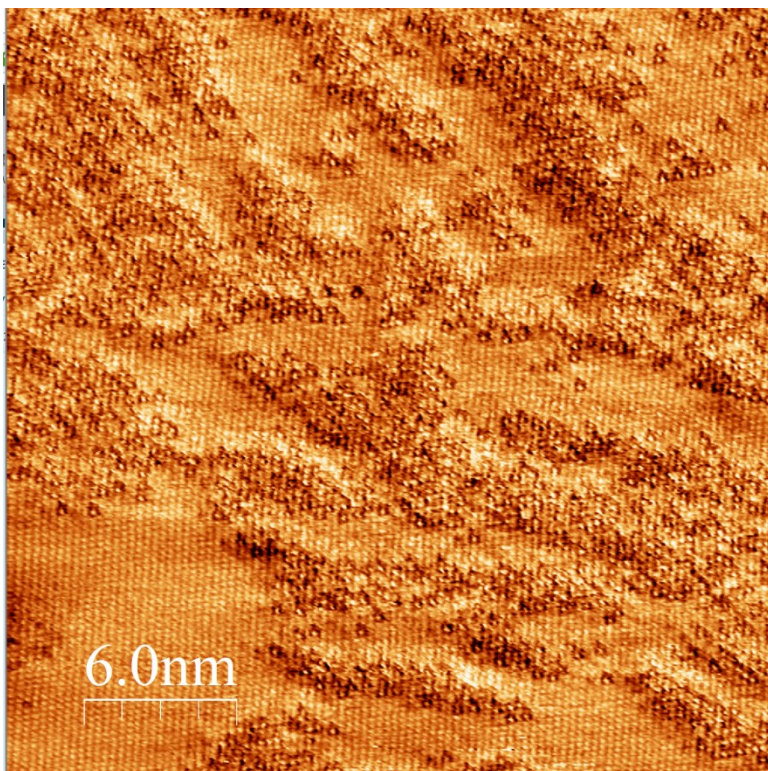
MoSe_2



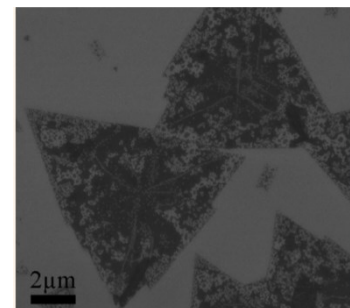
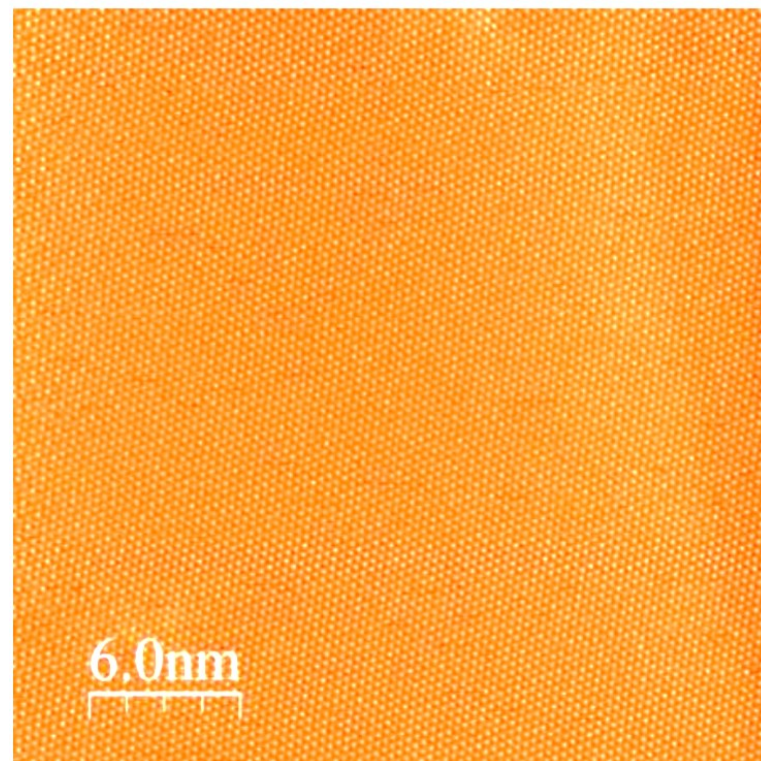


Hónapok után

MoS₂

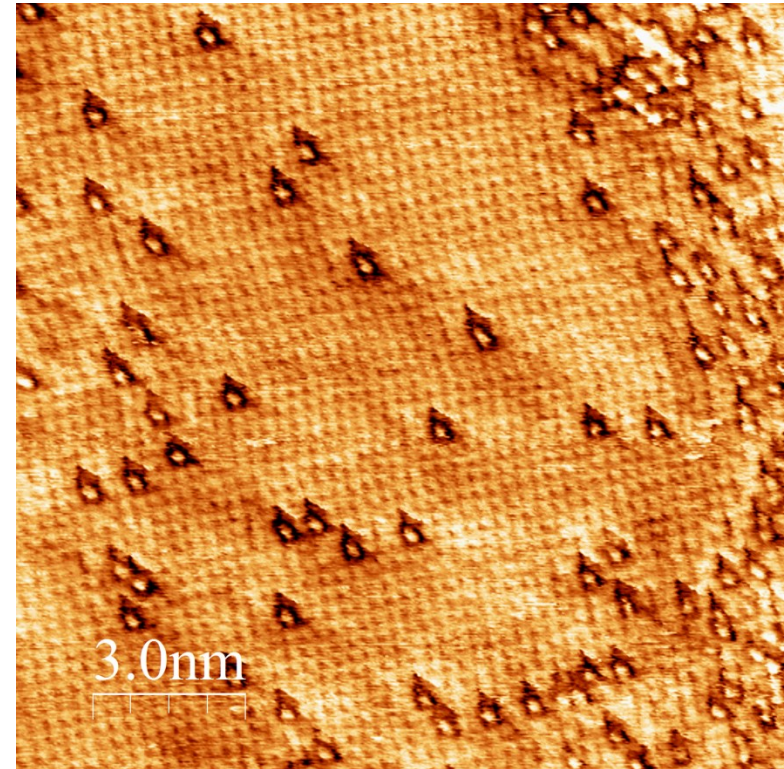
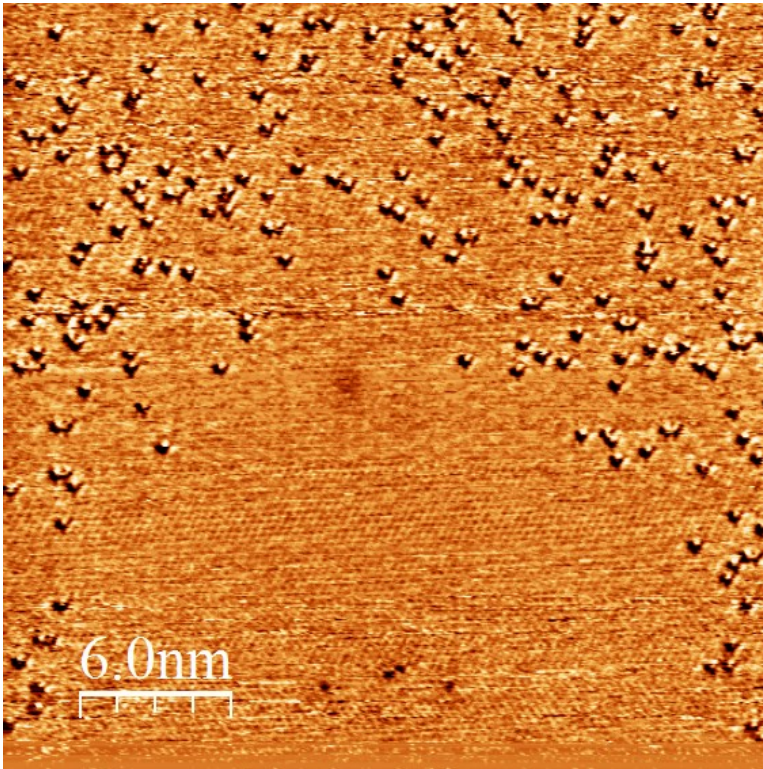


MoSe₂



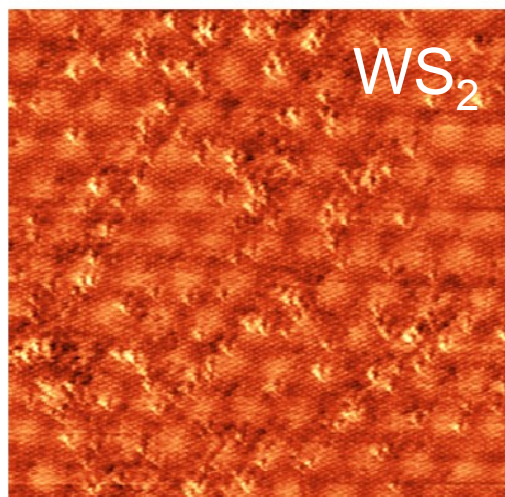
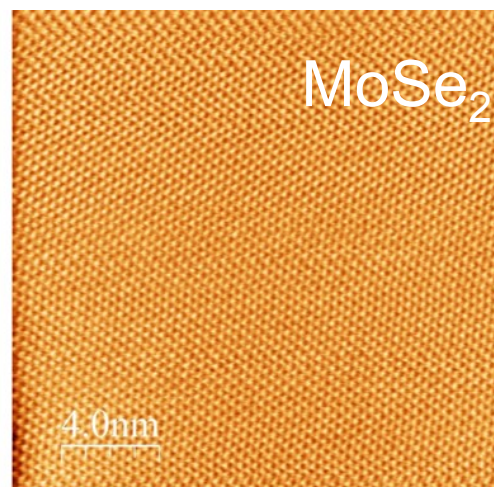
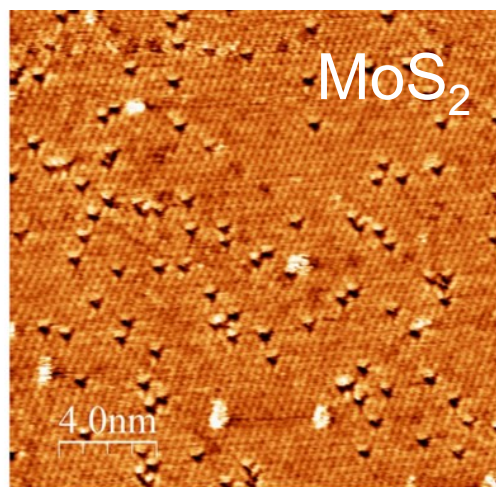


Oxigén szaturált S vakanciák MoS₂-ban



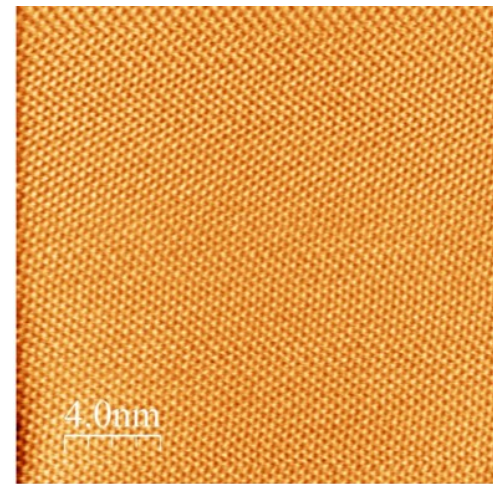
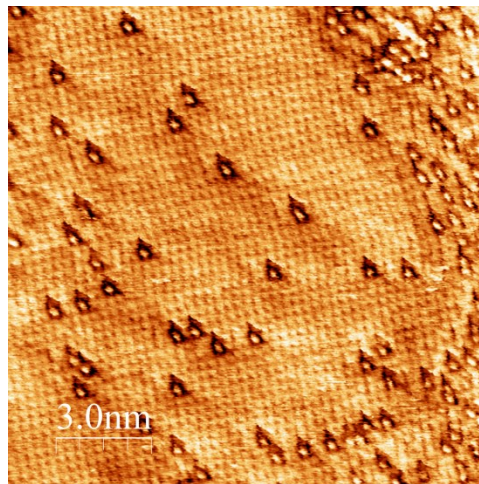
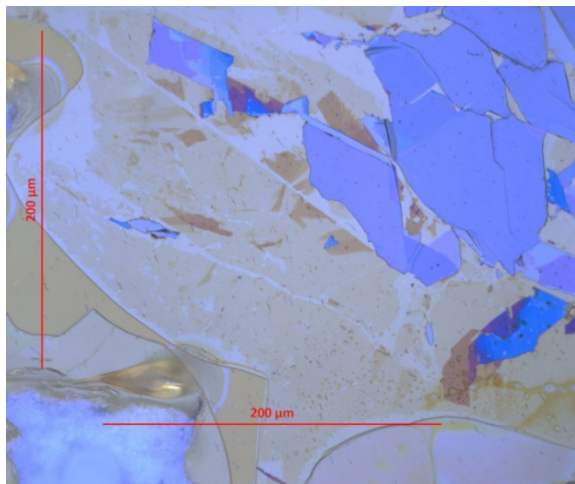


Szulfidok vs. Szelenidek





Összefoglalás



- Új előállítási módszer, akár milliméteres 2D kristályok
- MoS_2 atomi skálájú szerkezeti hibáinak első megfigyelése és lokalizált elektronállapotainak azonosítása
- A 2D szulfidok és szelenidek környezeti degradációjának atomi mechanizmusának direkt megfigyelése.



Köszönetnyilvánítás

Lendület
program

2014



European Research Council

Established by the European Commission

- MTA „Lendület” Program
- European Research Council Starting Grant 2015
- Korea Hungary Joint Laboratory for Nanosciences Converging Research Center Program through the Ministry of Education, Science and Technology (2010K000980)
- OTKA K 108753 és K 101599

