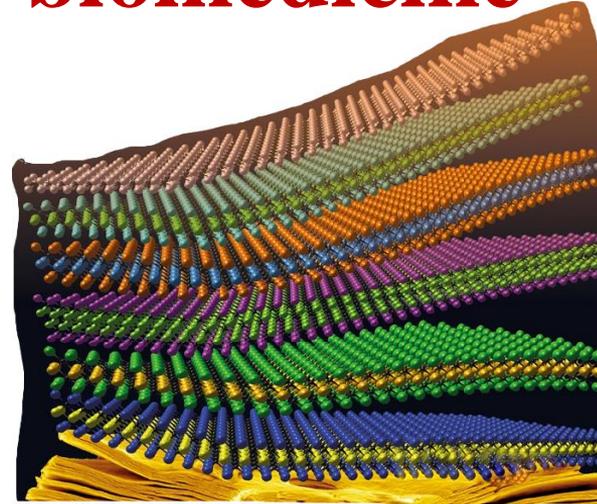
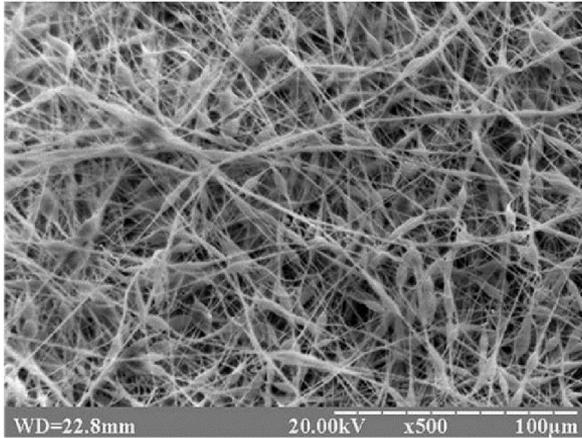




# MXenes, novel 2D nanomaterials, in various industries and in biomedicine



## Jean Monnet Support to Associations EUforUA

Nanofiber picture courtesy of **M. Pogorielov et al. 2018**, In vitro degradation and in vivo toxicity of NanoMatrix3D<sup>®</sup> polycaprolactone and poly(lactic acid) nanofibrous scaffolds. J Biomed Mater Res A 106(8):2200-2212.

MXene picture courtesy of **B. Anasori & Y. Gogotsi (Ed.)**, 2D Metal Carbides and Nitrides (MXenes), Springer 2019.

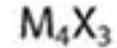
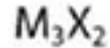
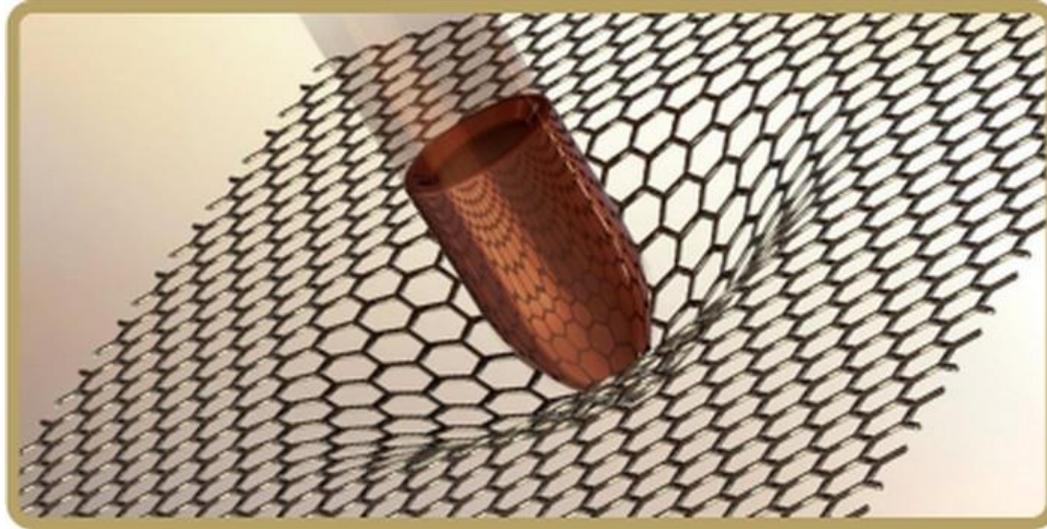


# ZMB

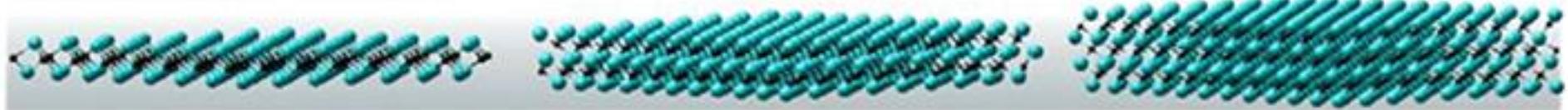
Zentrum für Medizinische Biotechnologie  
Center of Medical Biotechnology

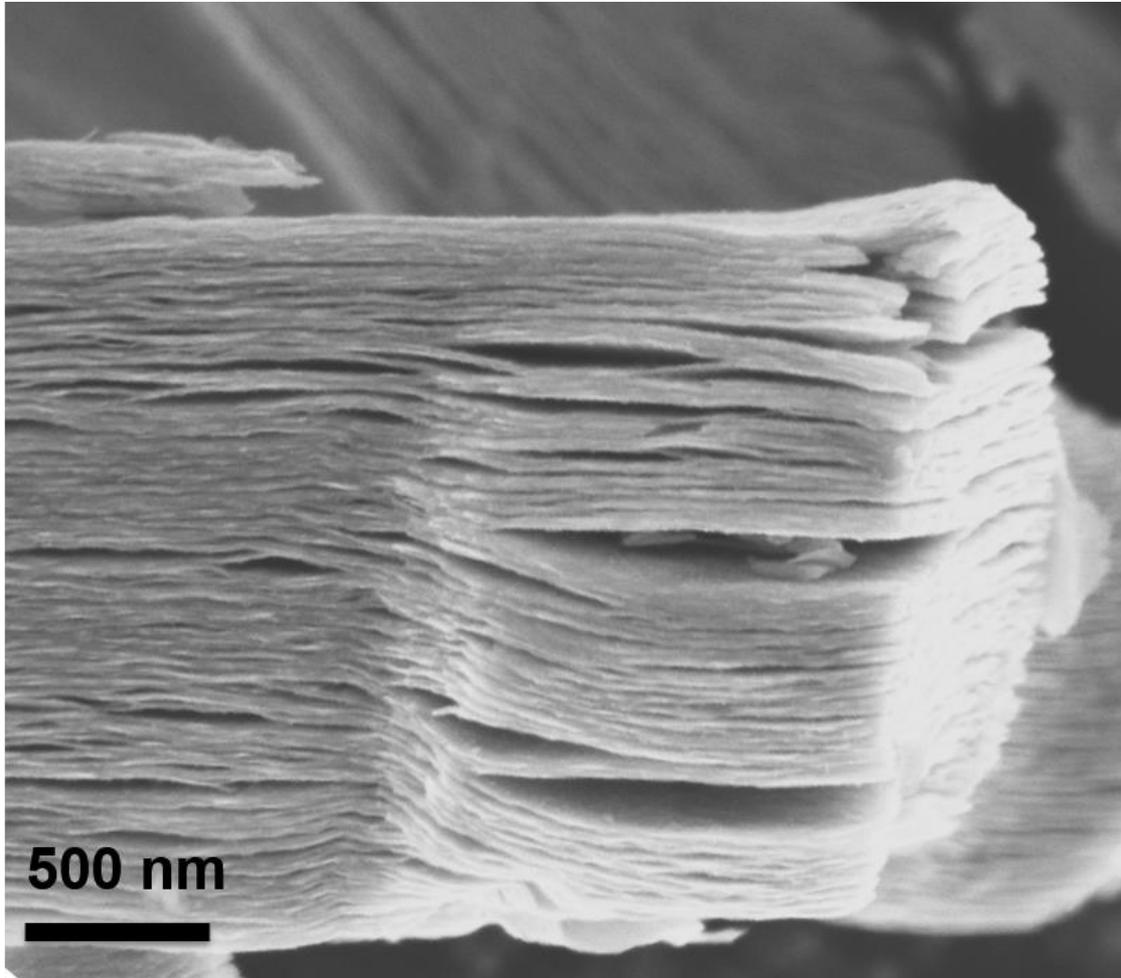


# MXenes $\neq$ graphene



Mono-transition metal MXenes







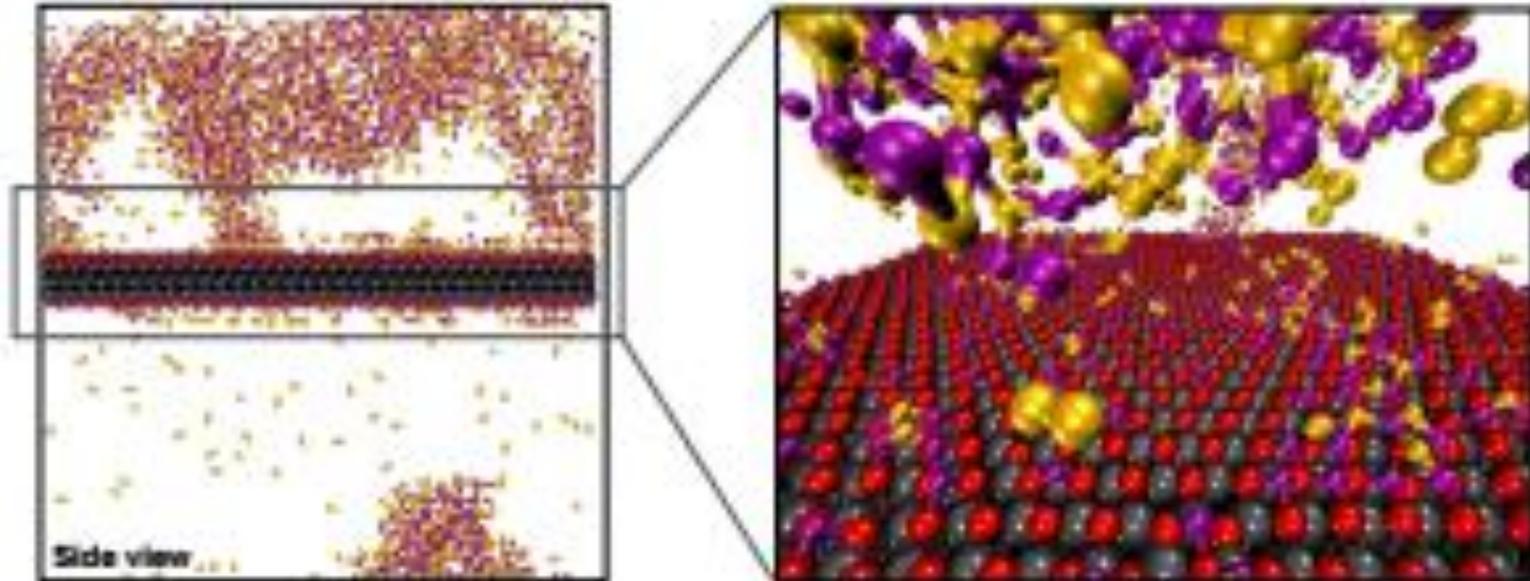
# Mxenes:



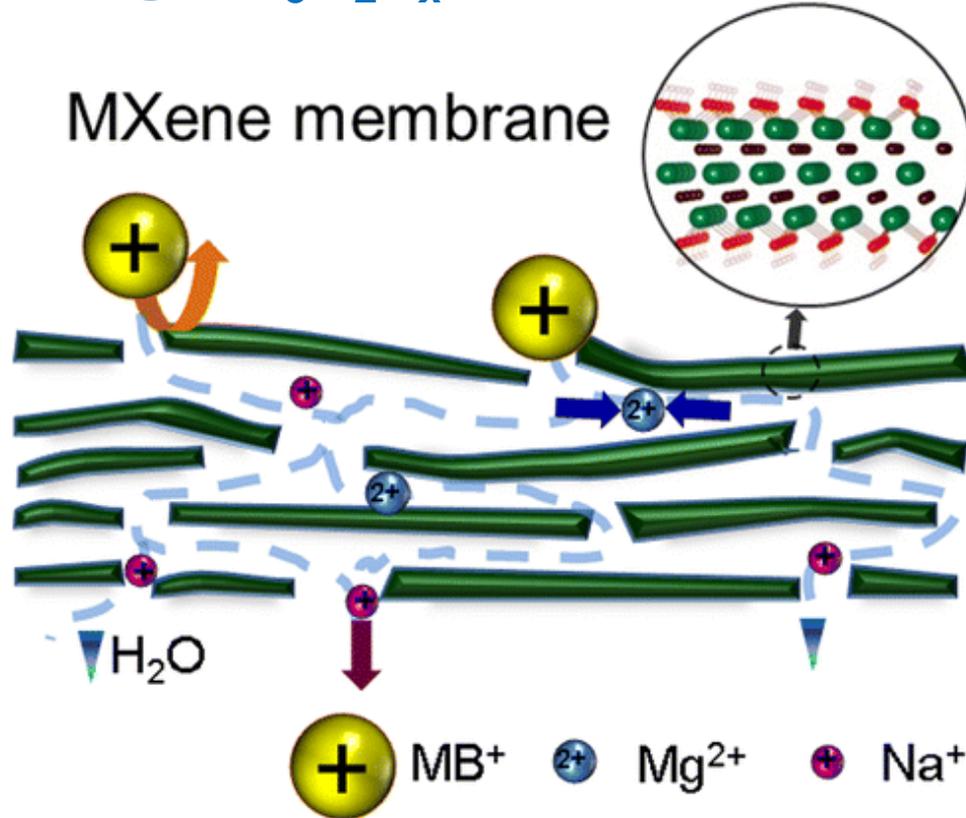
- Li-ion batteries and supercapacitors)
- composites, photocatalysis
- water purification
- gas sensors
- transparent conducting electrodes
- neural electrodes
- metamaterial
- SERS substrate
- photonic diode
- electrochromic device
- triboelectric nanogenerator



# Functionalization of 2D materials for enhancing OER/ORR catalytic activity in Li–oxygen batteries

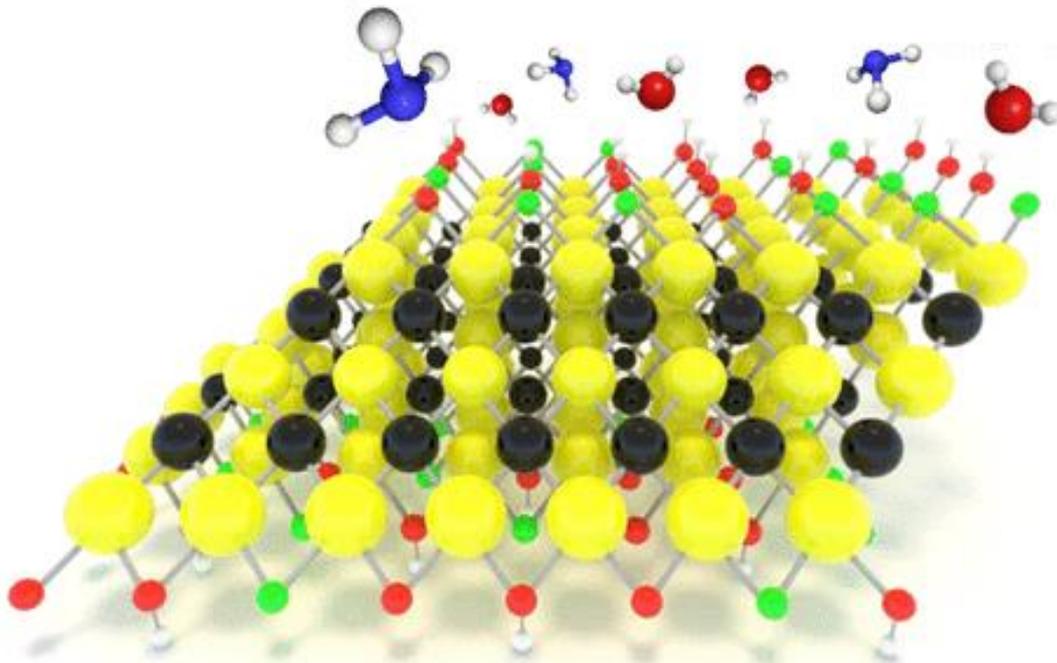


# Charge- and Size-Selective Ion Sieving Through $\text{Ti}_3\text{C}_2\text{T}_x$ MXene Membranes

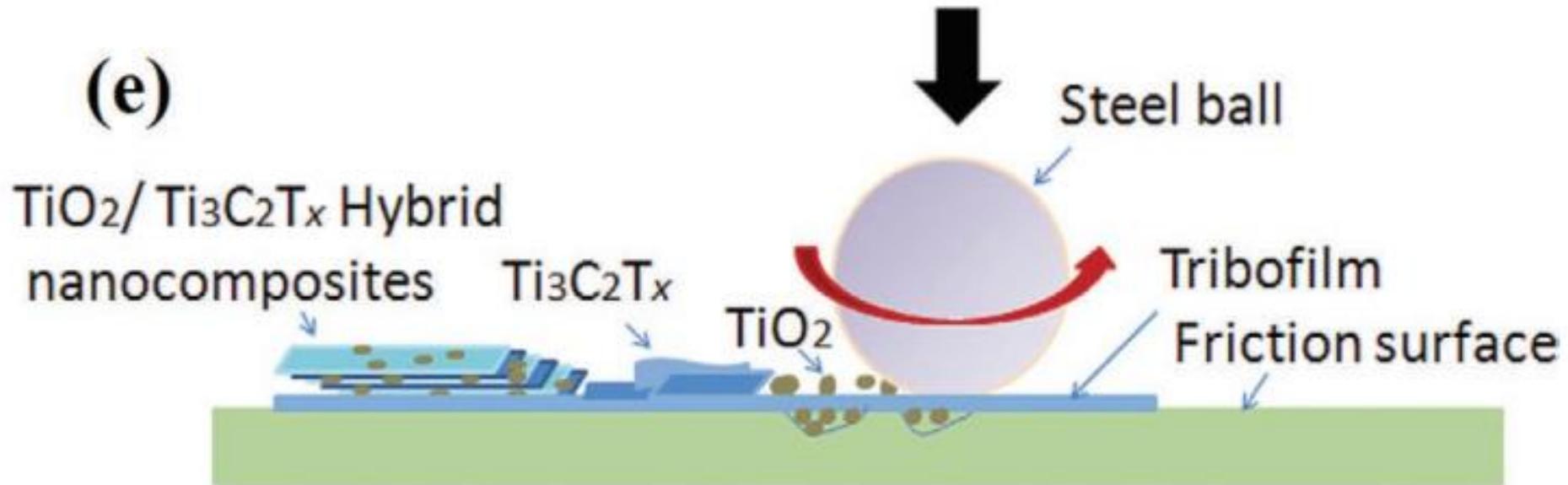




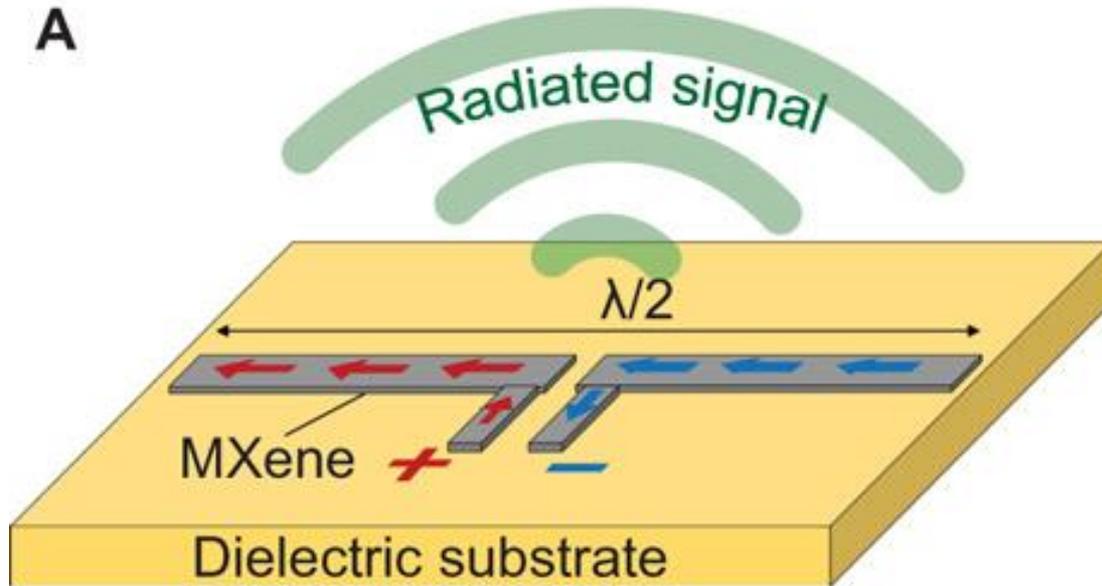
# Titanium Carbide MXene as $\text{NH}_3$ Sensor: Realistic First-Principles Study



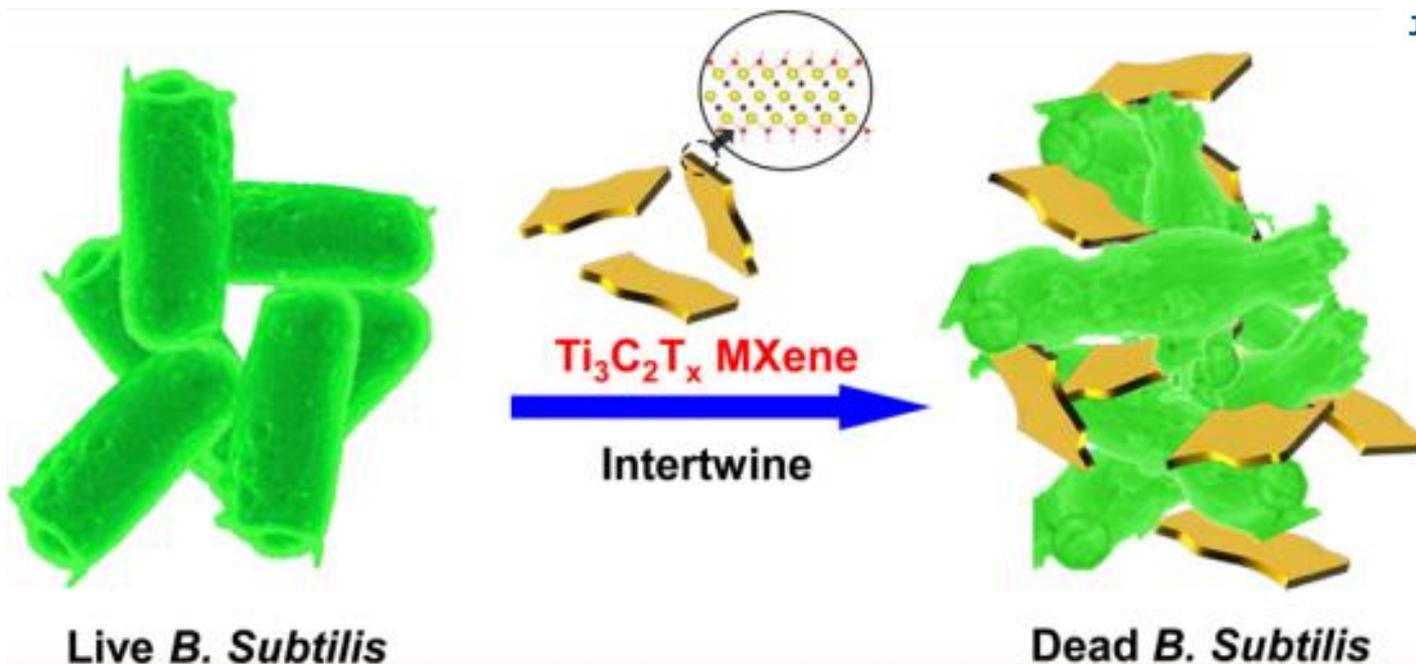
# Mechanotribological Aspects of MXene-Reinforced Nanocomposites



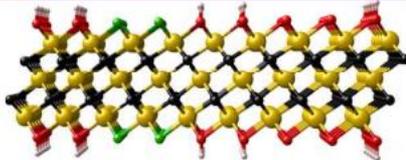
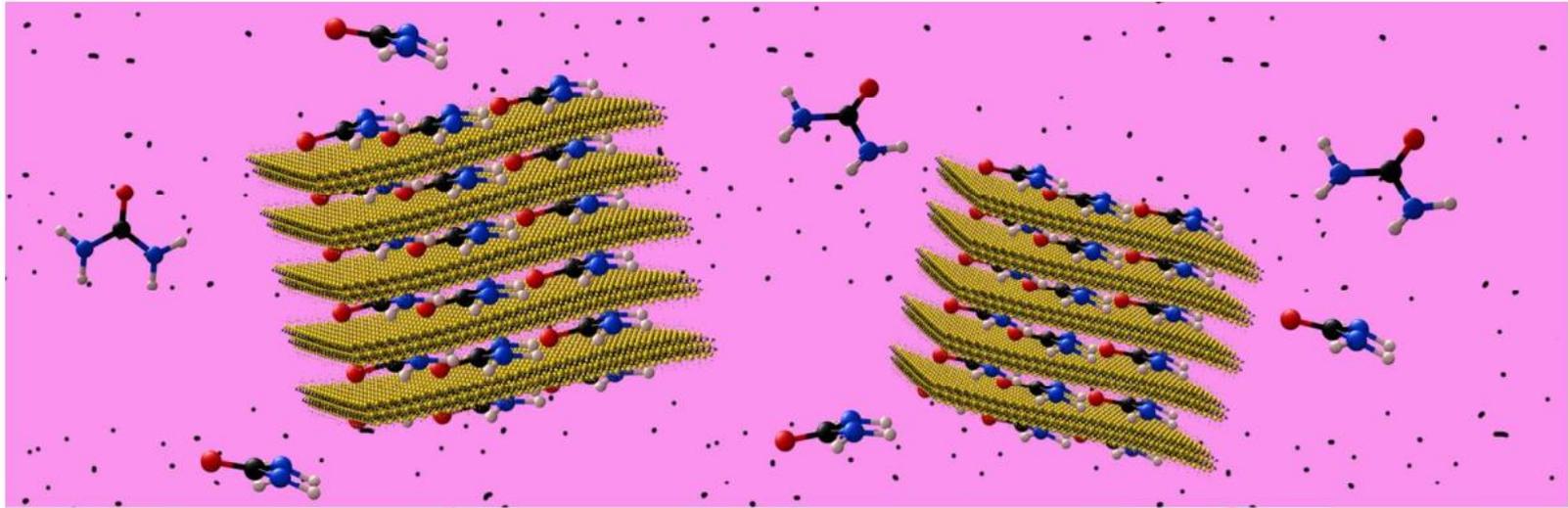
# 2D titanium carbide (MXene) for wireless communication



# Antibacterial Activity of $Ti_3C_2T_x$ MXene



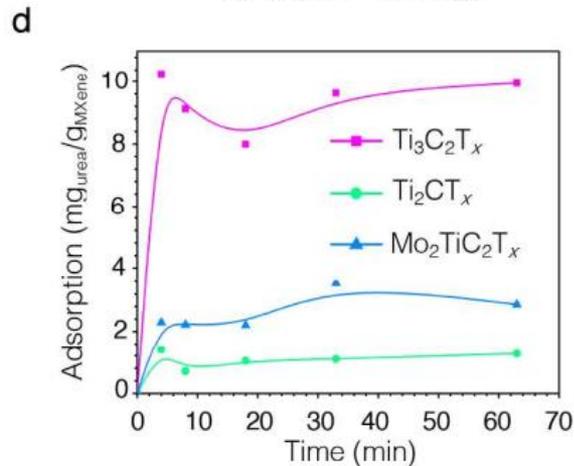
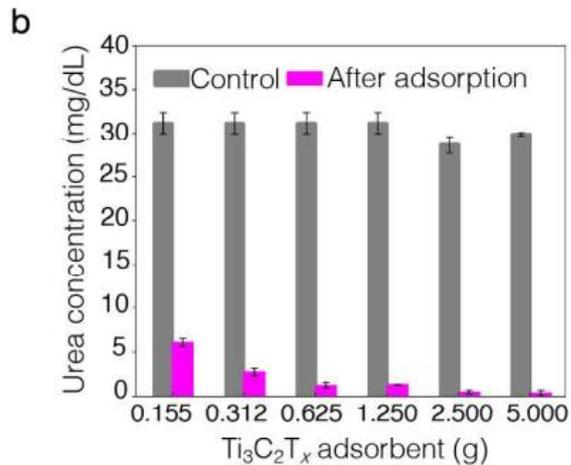
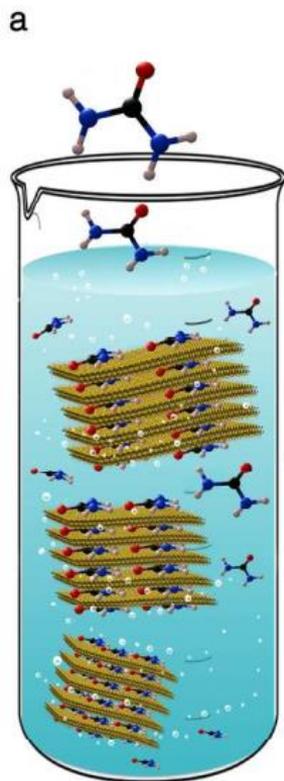
# MXene Sorbents for Removal of Urea from Dialysate: A Step toward the Wearable Artificial Kidney



2D  $Ti_3C_2T_x$  MXene



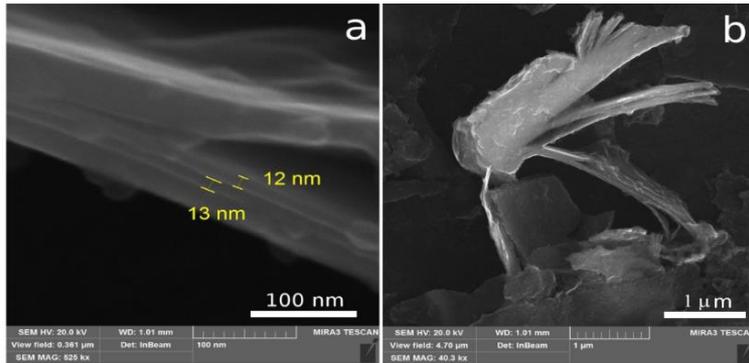
urea



## Delamination: segregation of multilayered MXenes into single layer flakes



Increased layer spacing is clearly observable



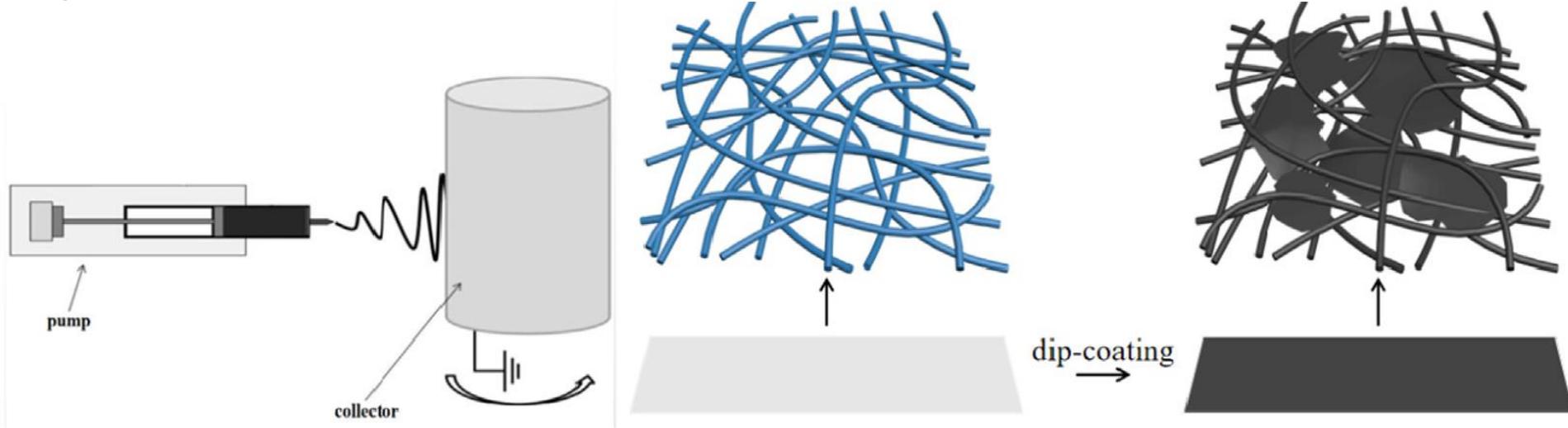
Electrospun nanofiber mats

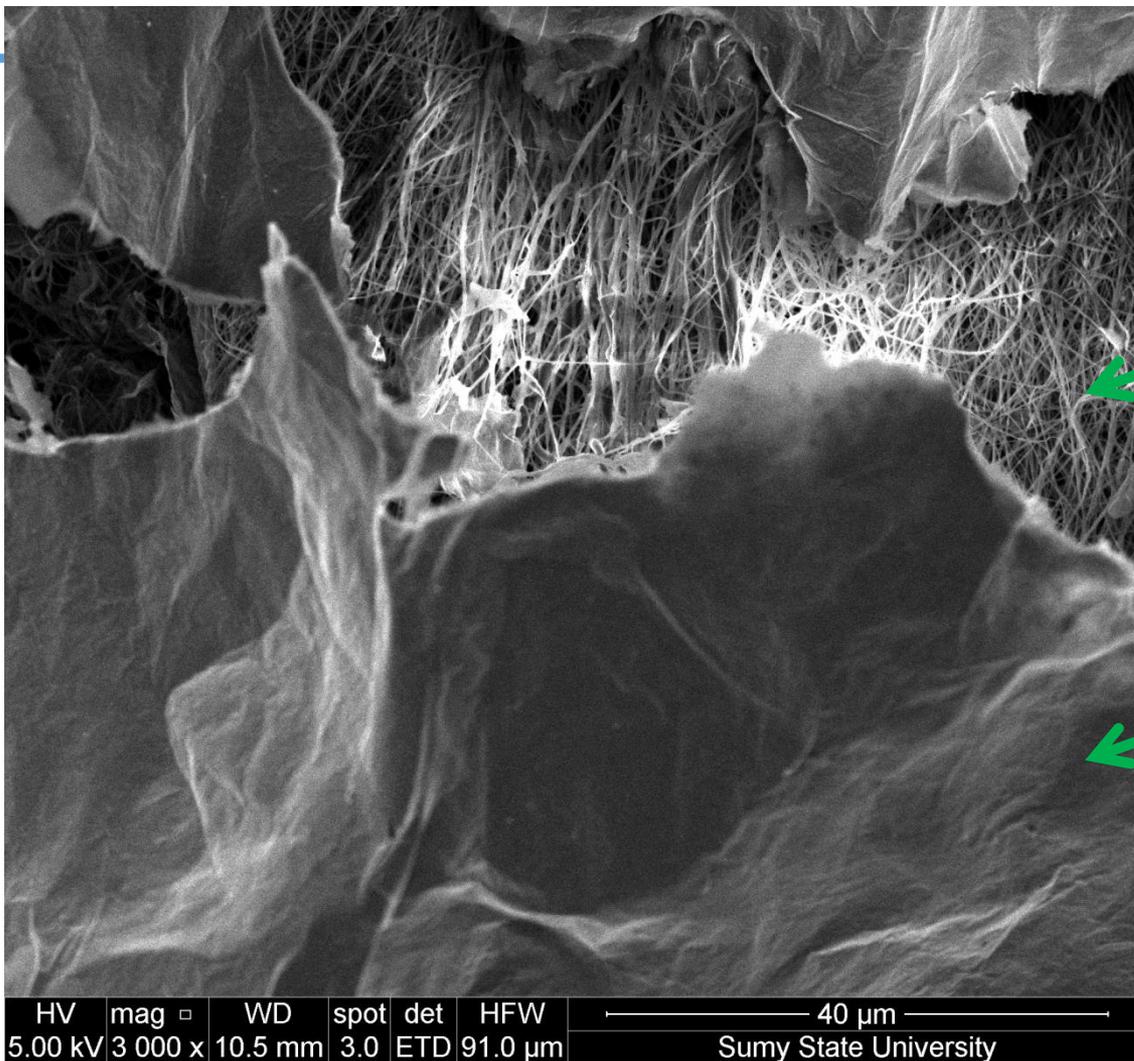


3D porous Ti scaffolds

Image courtesy of MRC

# Electrospinning / dip coating





PCL fibers

MXene foil

# MXenes on 3D porous Ti scaffolds

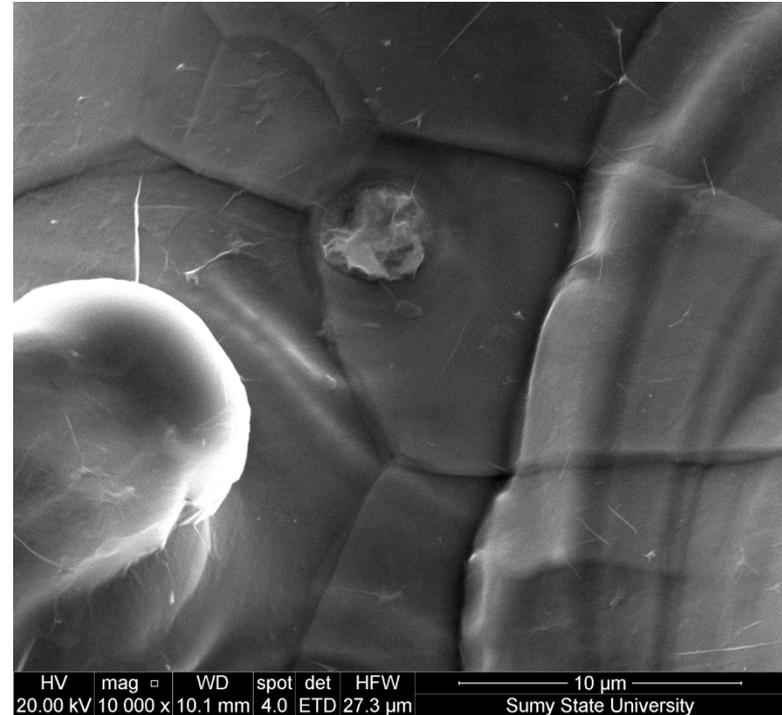
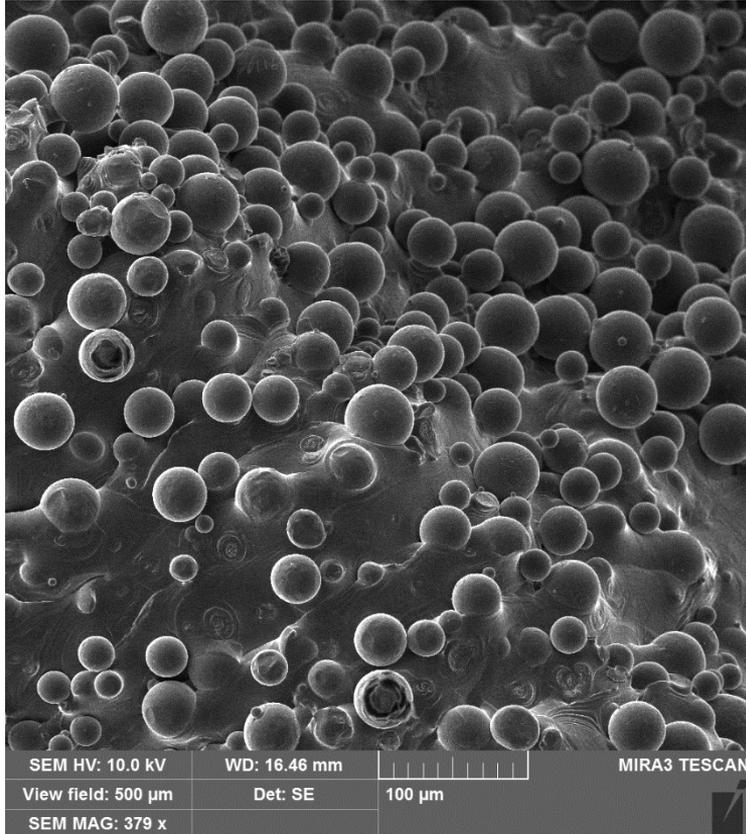
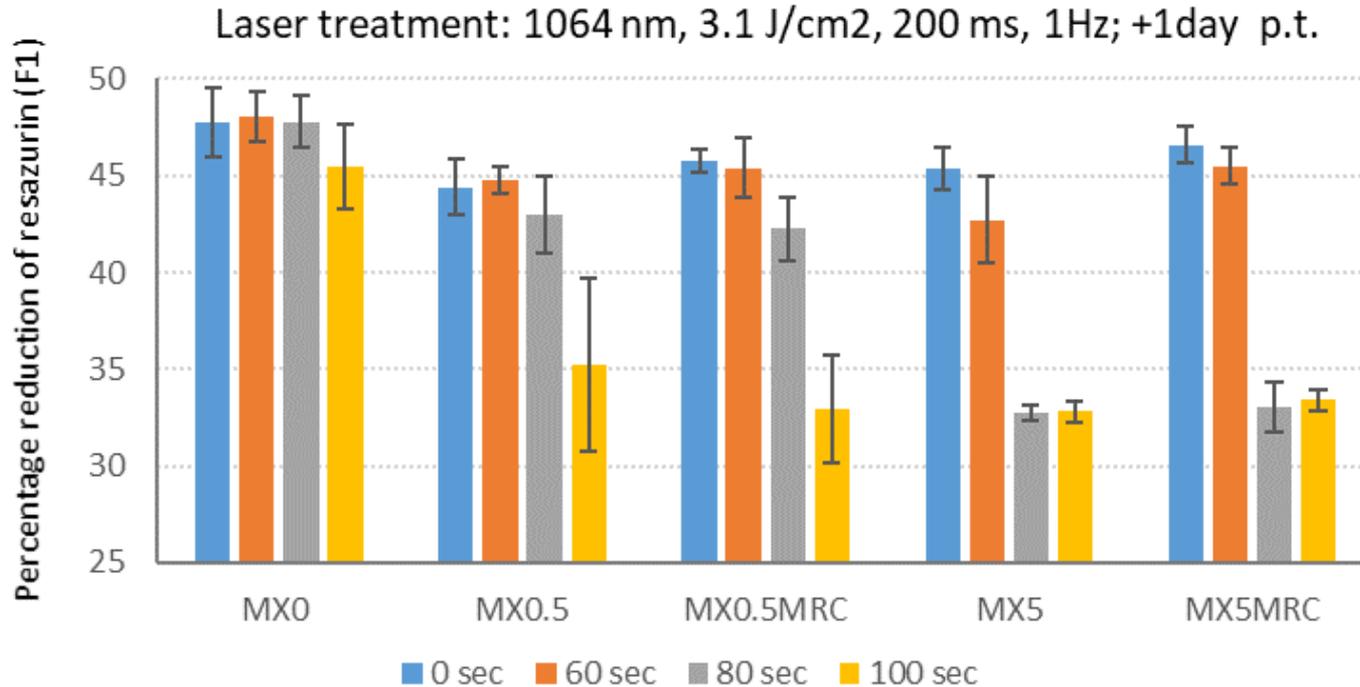


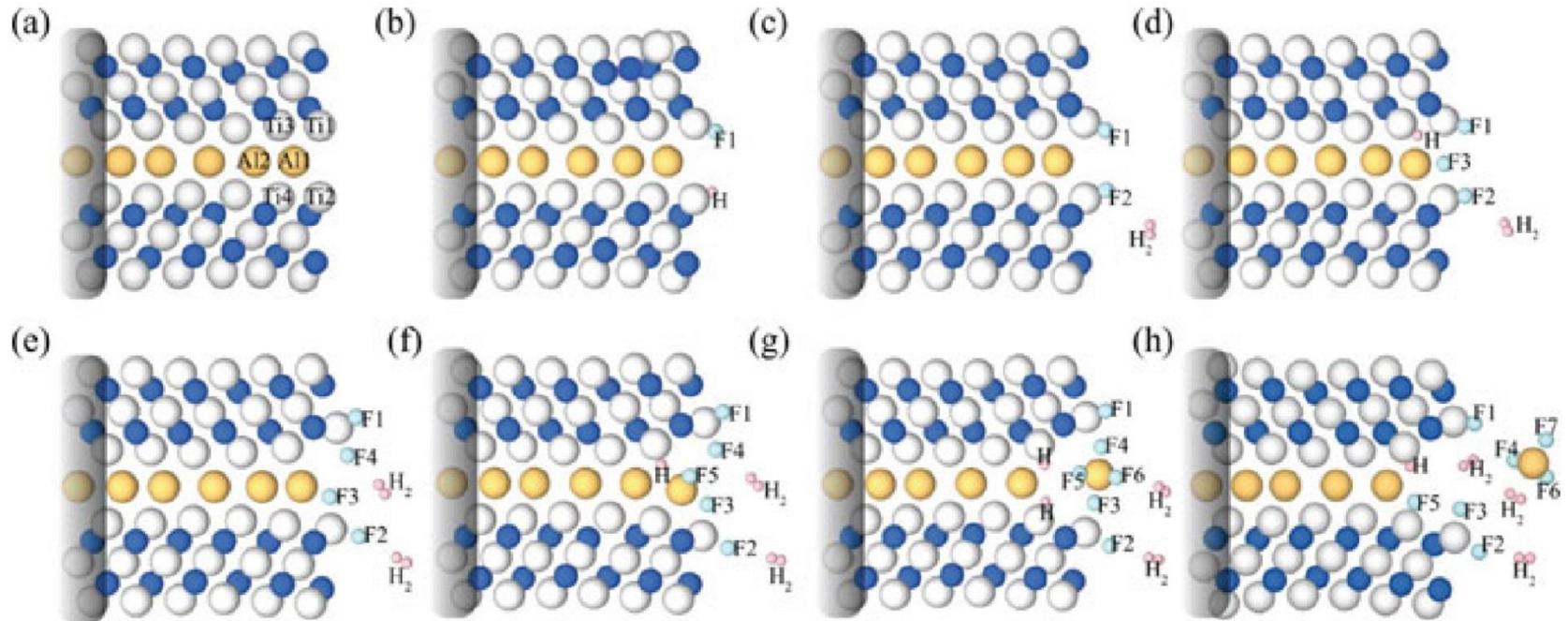
Image courtesy of MRC



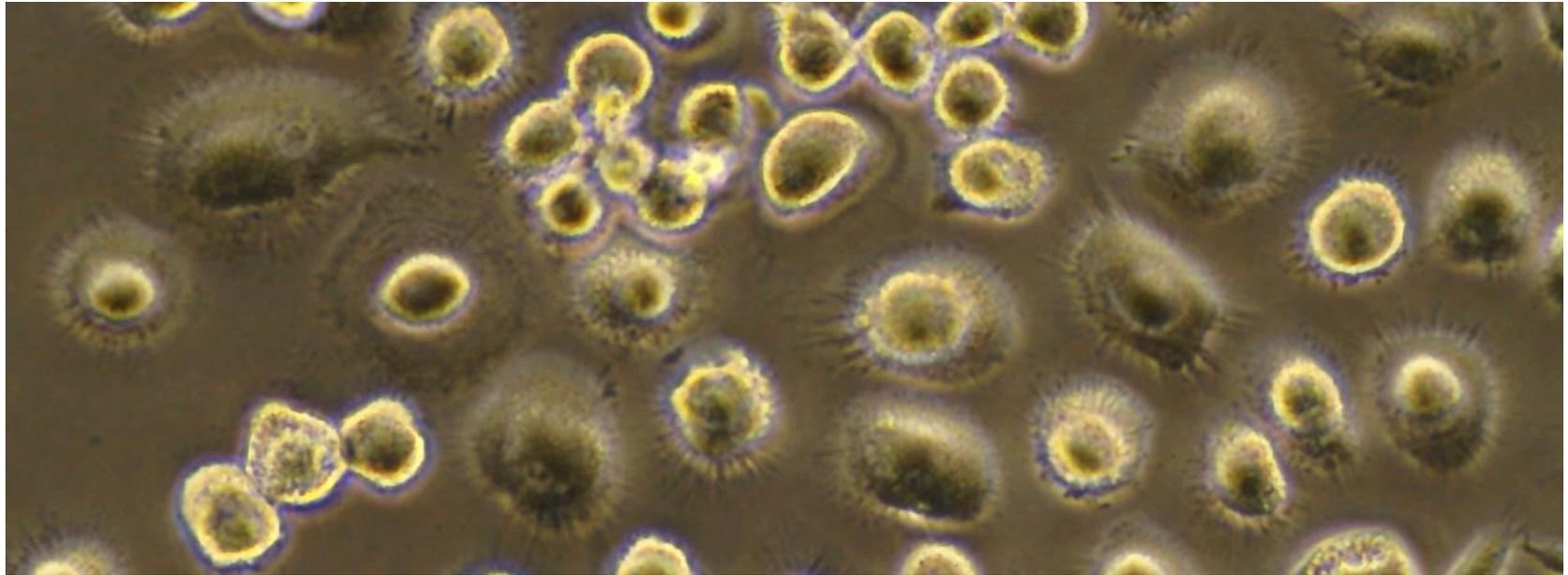
# MXenes: photothermal effect



# Possibilities for covalent functionalization of MXenes



# Human macrophages in cell culture





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KIITOS  
DĚKUJI  
ДЯКУЮ  
СПАСИБО  
THANK YOU  
DANKE SCHÖN  
MUITO OBRIGADO

