Marco Altomare

https://people.utwente.nl/m.altomare
m.altomare@utwente.nl

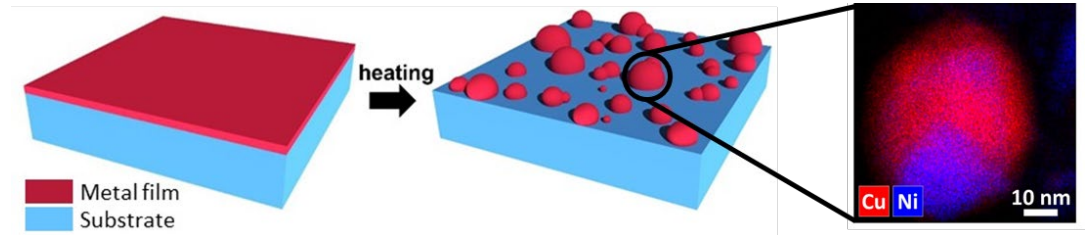
UNIVERSITY OF TWENTE. | MESA+ INSTITUTE

NWO DFG Deutsche Forschungsgemeinschaft

Binder-free electrocatalyst nanoparticles for water electrolysis

- **What**: Binder-free Pt & Ir nanoparticles (NPs), ultra-low loadings
  Directly on conductive gas-diffusion or porous transport layers
- **How**: Physical vapor deposition & solid-state dewetting (PVD-SSD)
- **Goals**: i) Minimize loading by maximizing NPs' surface area
  ii) Enhance intrinsic activity by support effects
  iii) Increase electrode mechanical and electrochemical stability
- **Current work** shows:

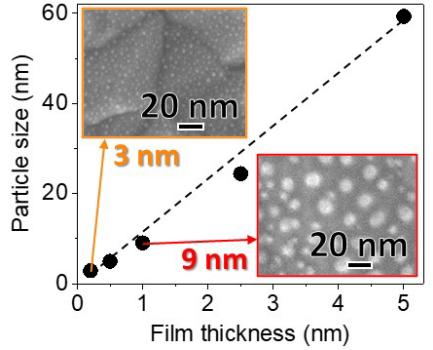
✓ Reliable control on electrocatalyst loading, composition, structure
✓ Possible on conductive oxides, carbon materials, and metals
✓ Strong catalyst/support adhesion and good electrical conductivity
✓ Enhanced intrinsic activity due to strong catalyst/support interaction



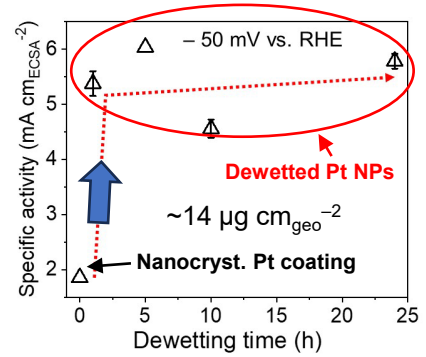
Altomare et al., **Chem. Sci. 2016**, 7, 6865

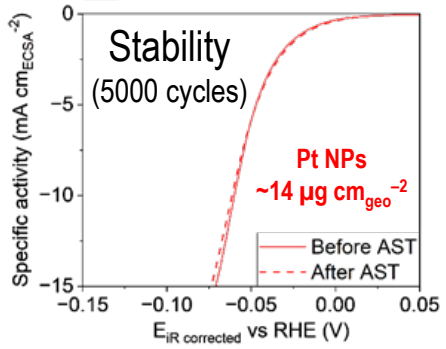
Altomare et al., **ACS Catal. 2018**, 8, 5298 & **ACS Catal. 2020**, 10, 8293

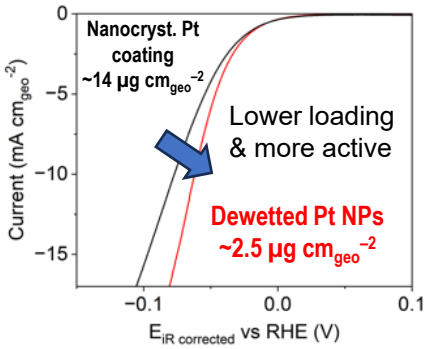
Dewetted NPs' loading & size



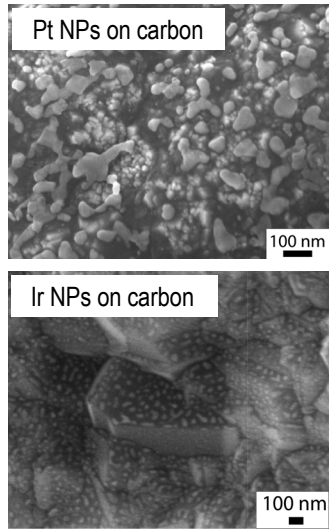
Pt NPs for H_2 evolution





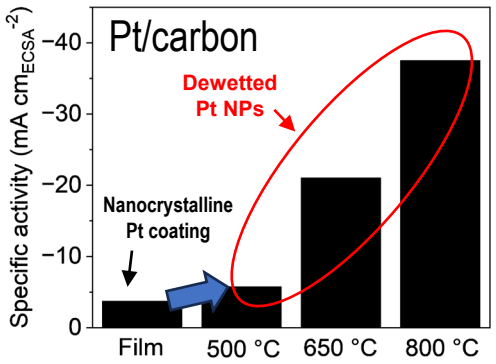


Altomare et al., **2024 Adv. Funct. Mater.**, just accepted https://doi.org/10.1002/adfm.202403628



Pt and Ir NPs for water electrolysis

Controlled thermal treatment enhances H_2 generation



Altomare et al., in preparation