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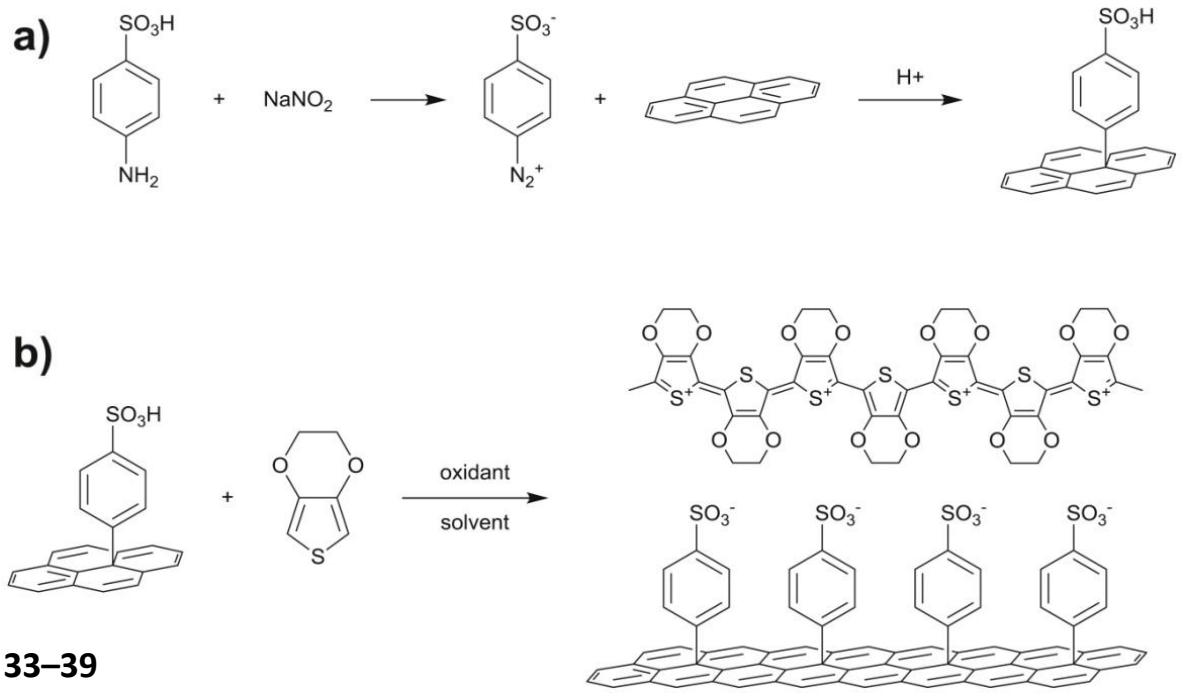
Academy of Sciences of the Czech Republic

Graphene as substrate for selective self-assembly of 2-D materials for optoelectronic applications

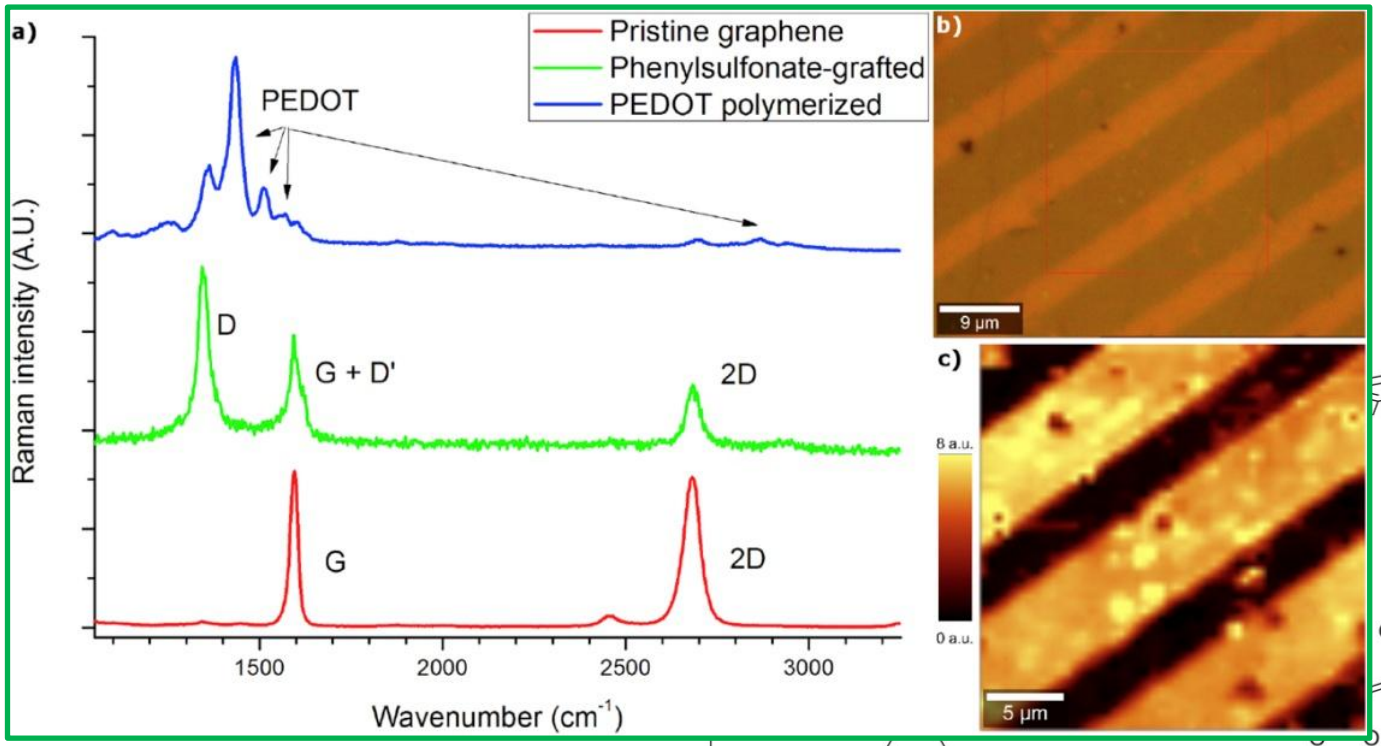
Valentino Libero Pio Guerra

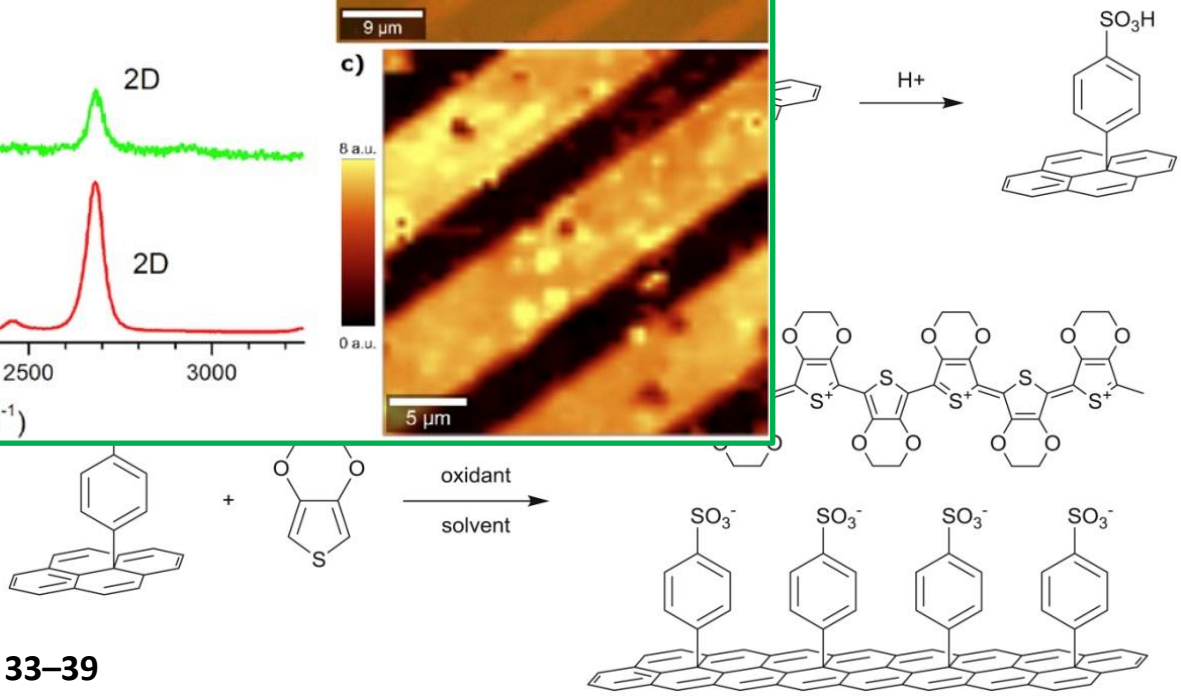
Functionalization of graphene and EDOT polymerization



P. Kovaříček *et al.*, Carbon, 2017, 113, 33–39

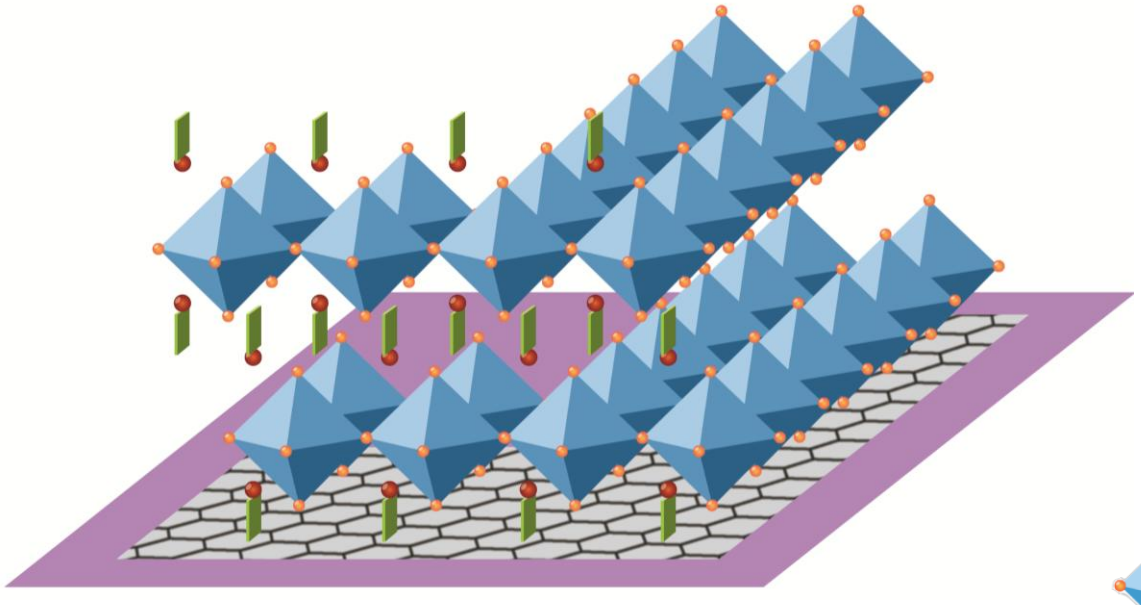
Functionalization of graphene and EDOT polymerization

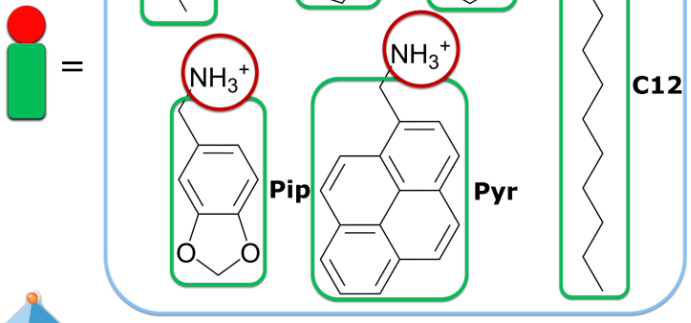




P. Kovaříček *et al.*, Carbon, 2017, 113, 33–39

New material – choosing the precursors

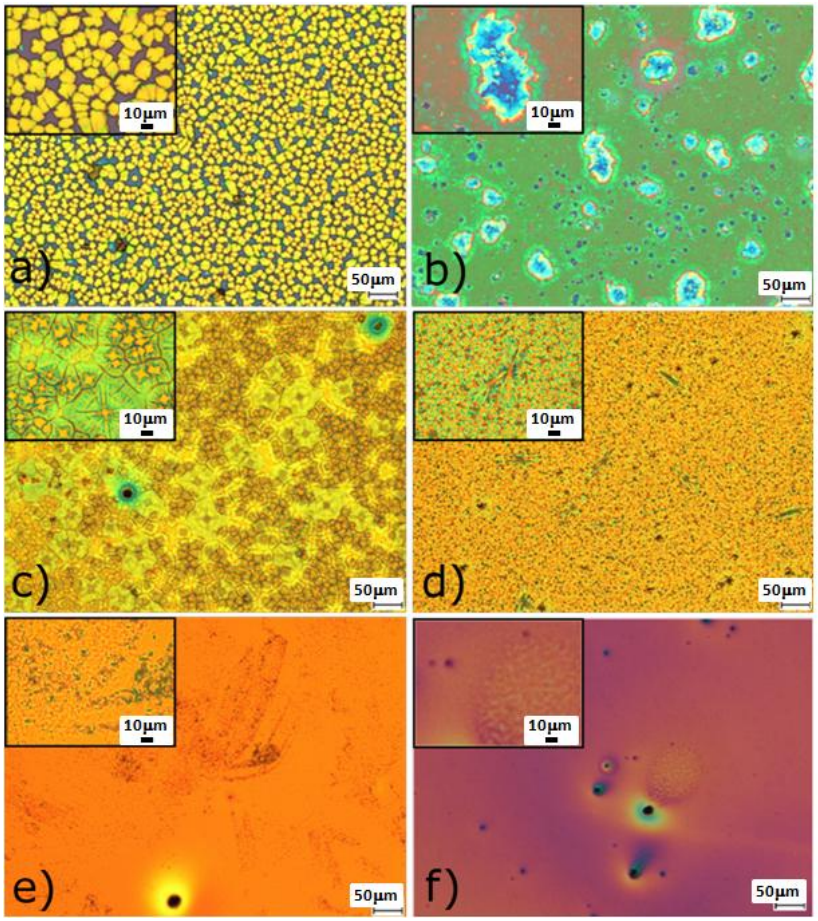




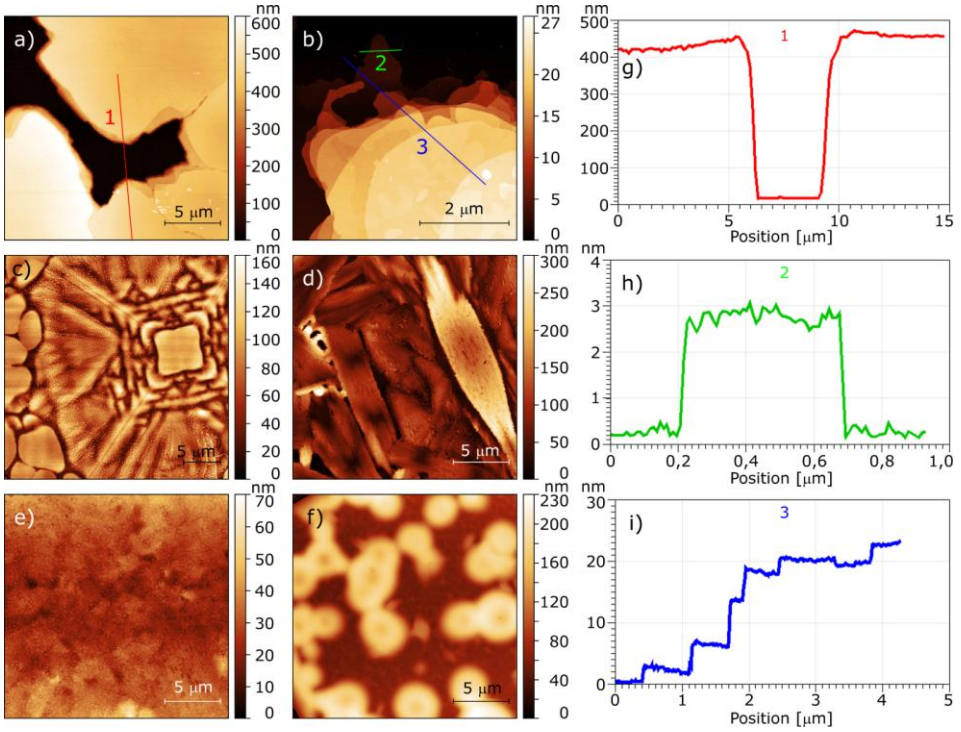
= (PbI_6)

V. L. P. Guerra *et al.*, Nanoscale, 2018, 10, 3198-3211

Morphology



Optical microscopy

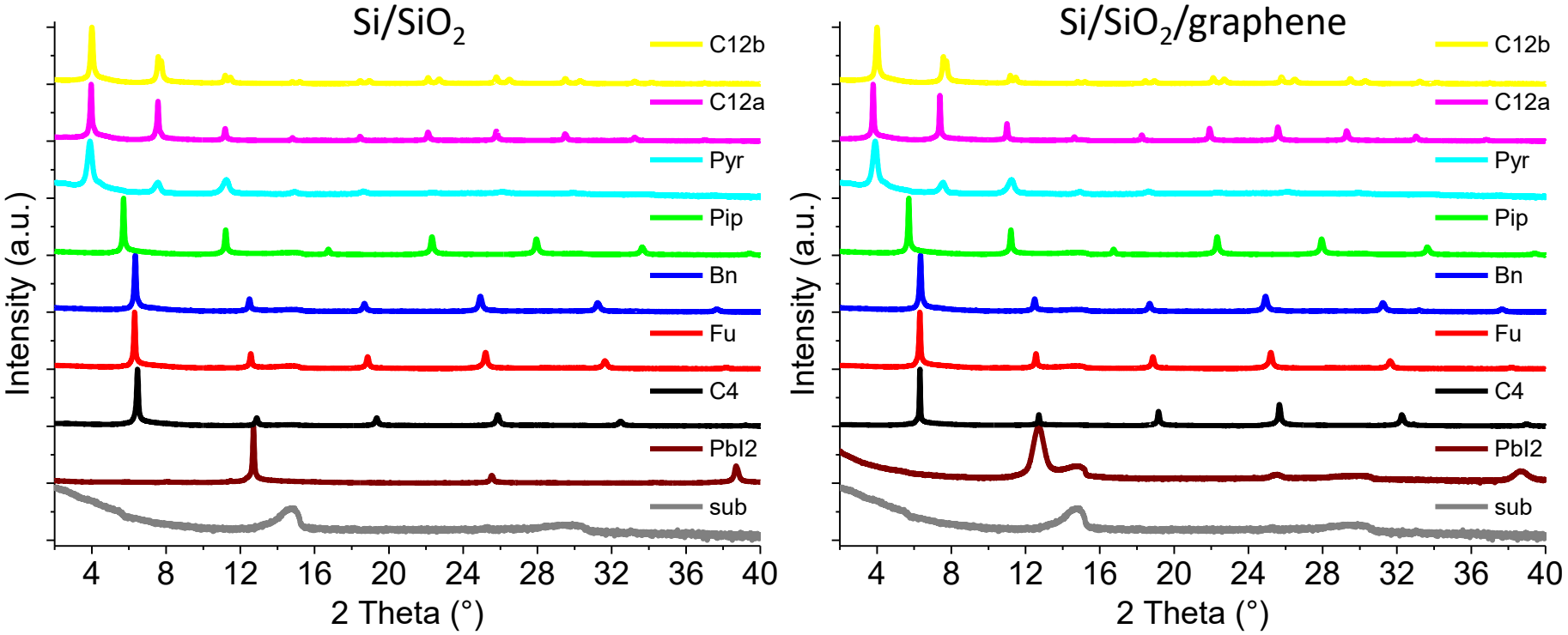


Atomic Force Microscopy

*Oxygen plasma treated Si/SiO_2

Structure

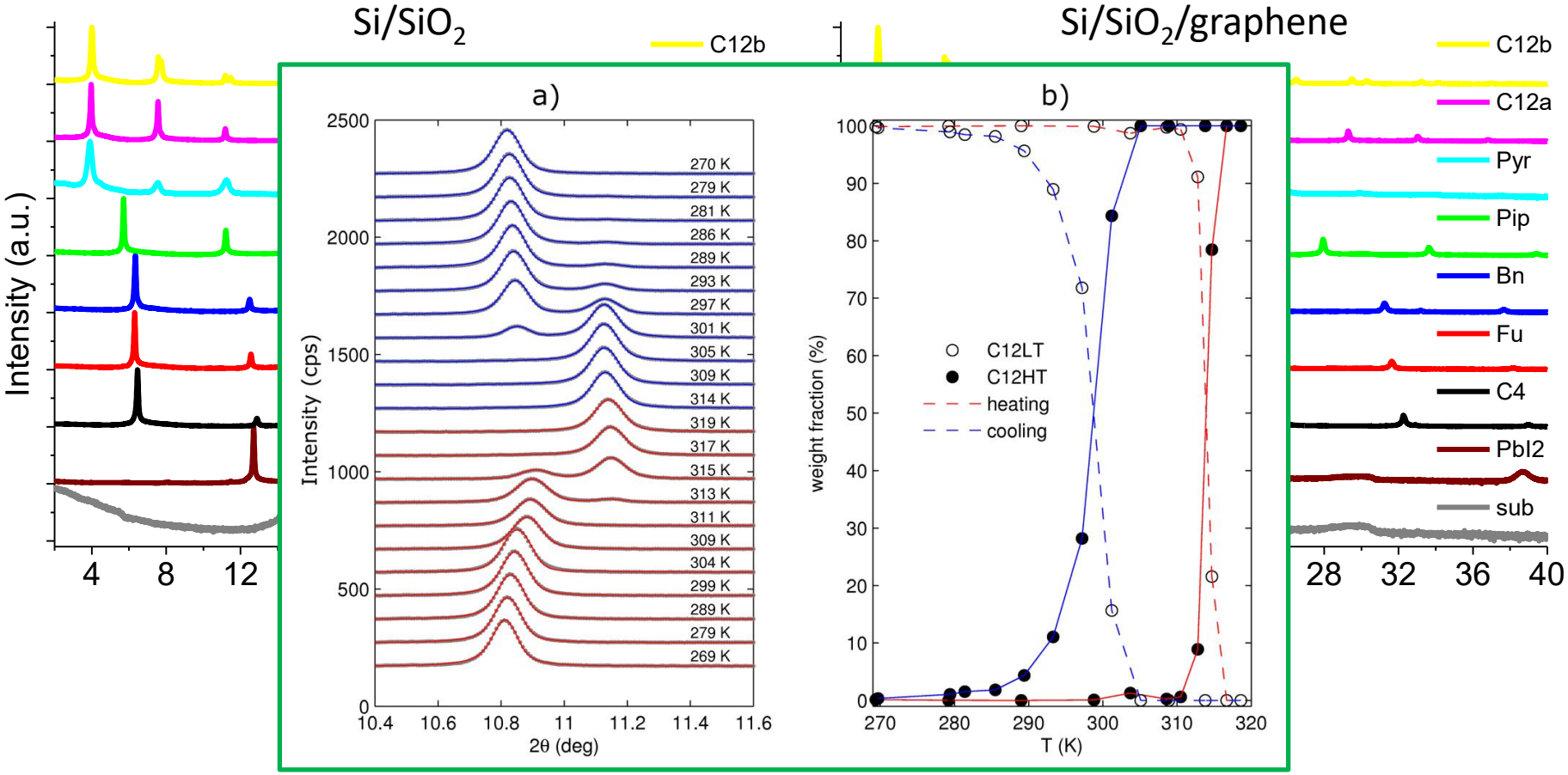
X-Ray Diffraction of the films on:



Only peaks corresponding to 00ℓ diffraction are visible → strong preferential orientation

Structure

X-Ray Diffraction of the films on:



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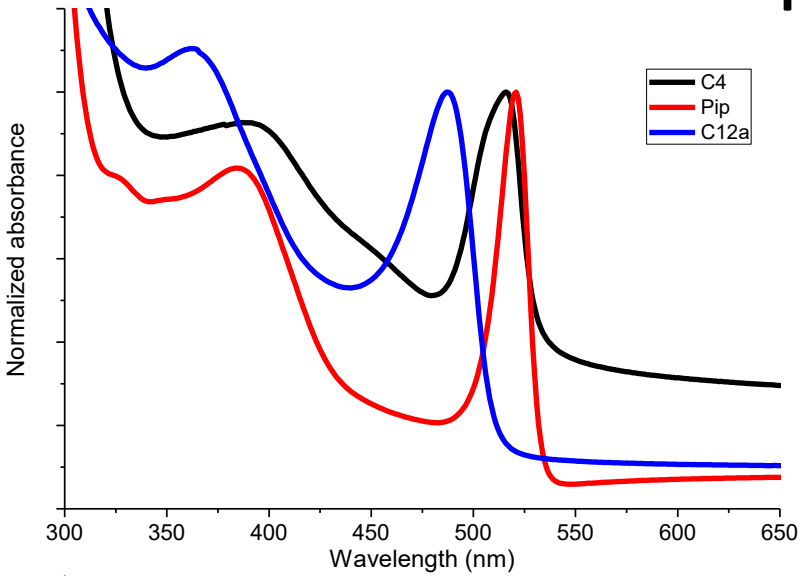
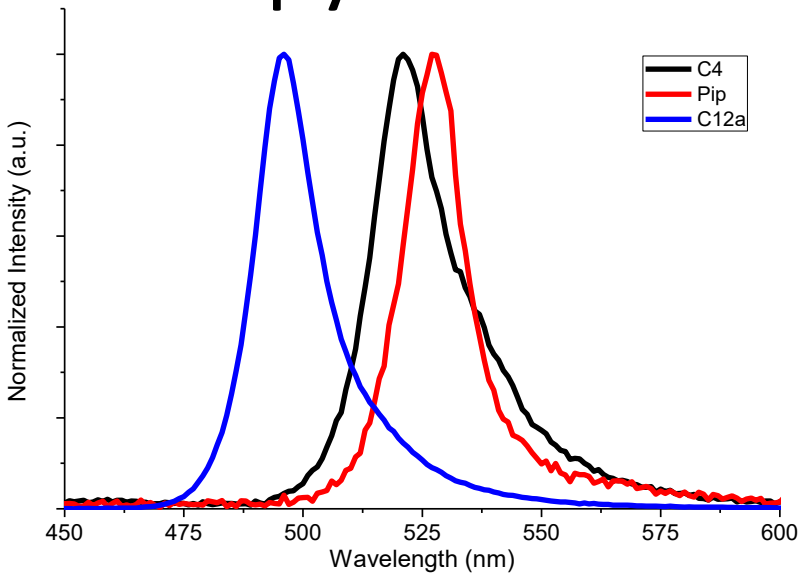
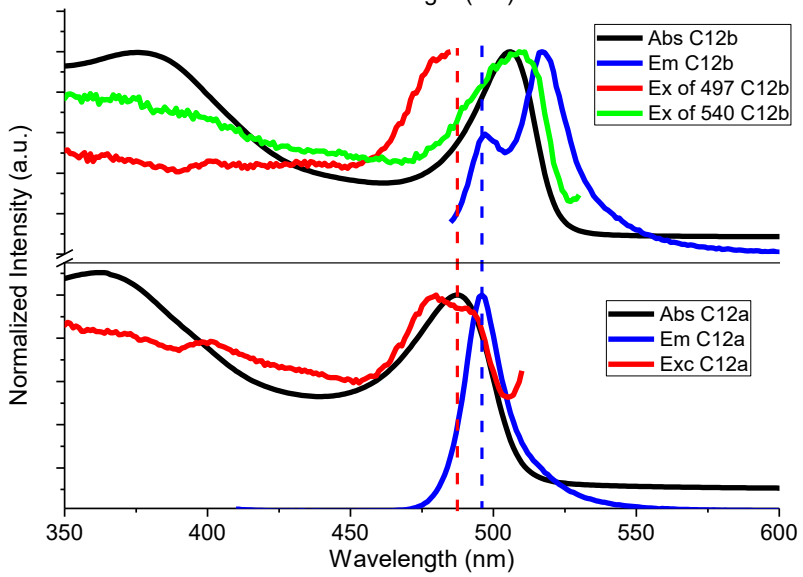
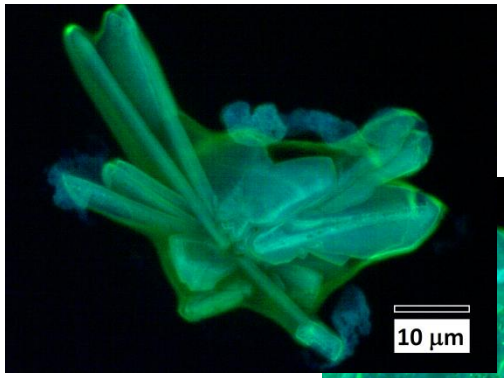
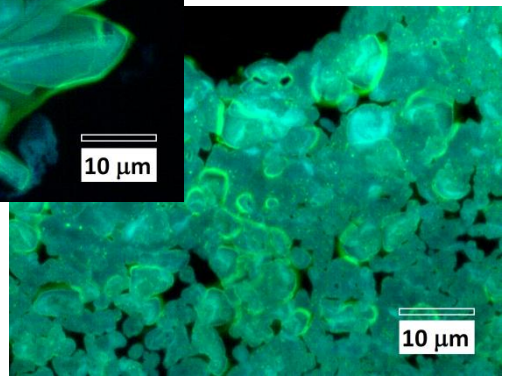
Uv-vis spectroscopy





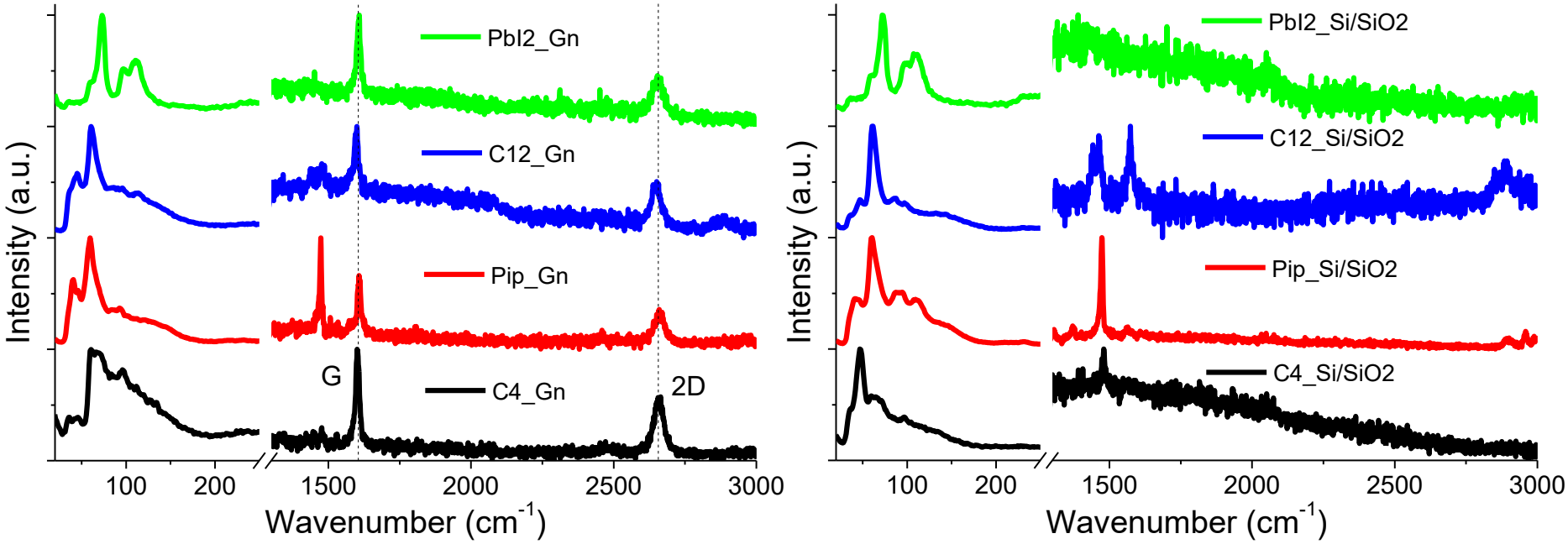






Ex filter: λ < 450nm
Em filter: λ > 450nm

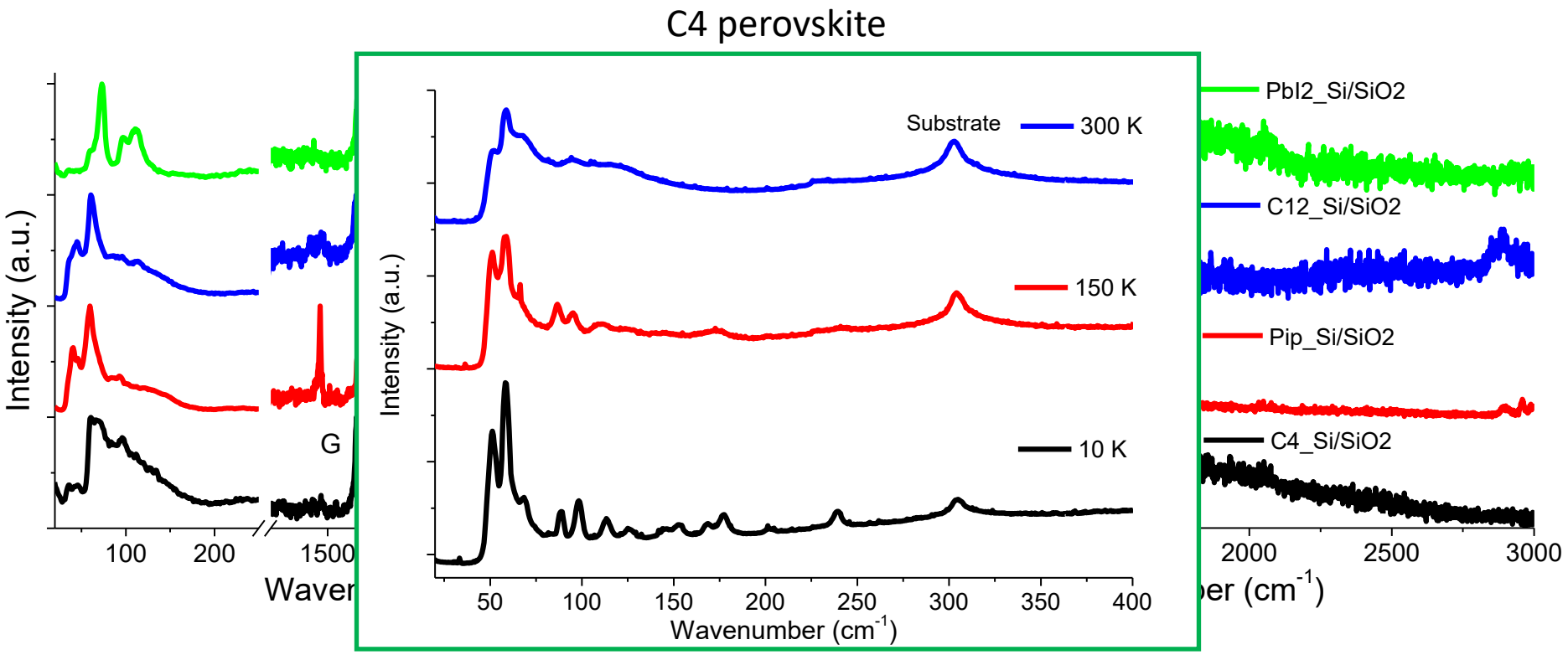
Raman spectroscopy



Low wavenumber region: vibrational fingerprint of Pb-I network

High wavenumber region: 1470 cm^{-1} CH_2 scissoring, 1600 cm^{-1} G mode, 2650 cm^{-1} 2D mode

Raman spectroscopy



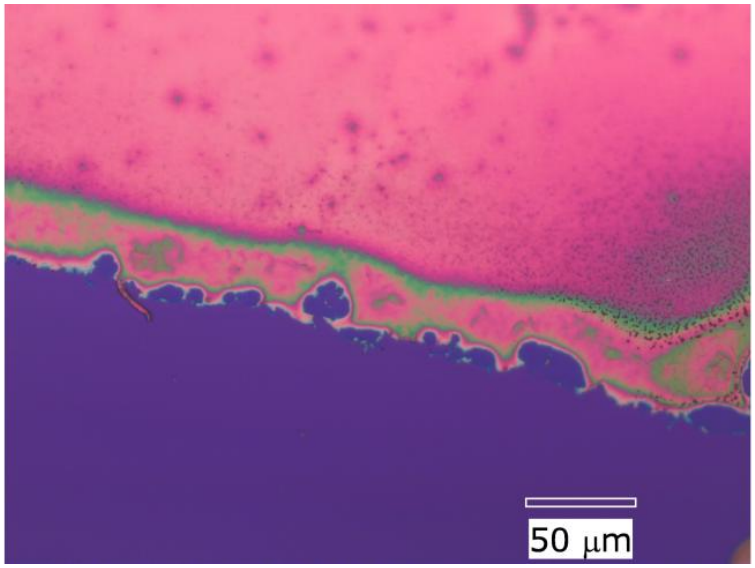
Low wavenumber region: vibrational fingerprint of Pb-I network

High wavenumber region: 1470 cm^{-1} CH_2 scissoring, 1600 cm^{-1} G mode, 2650 cm^{-1} 2D mode

Selectivity of the assembly

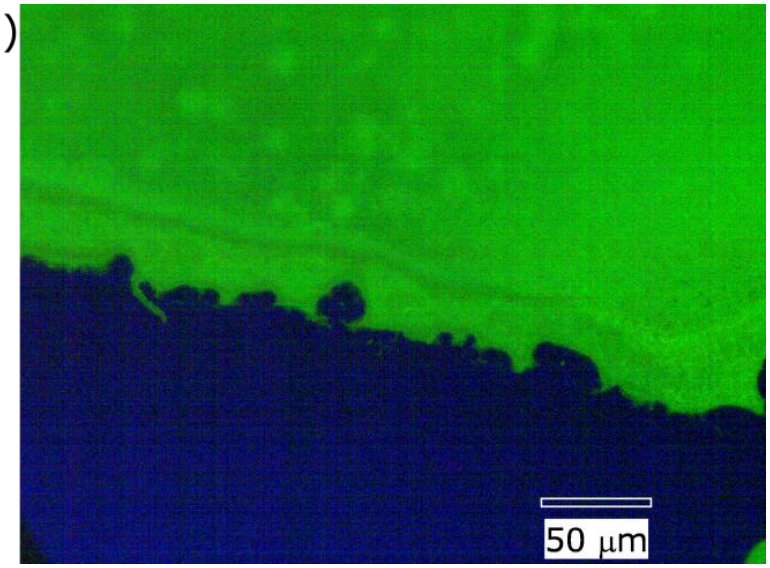
Optical microscopy

a)



Bright field

b)

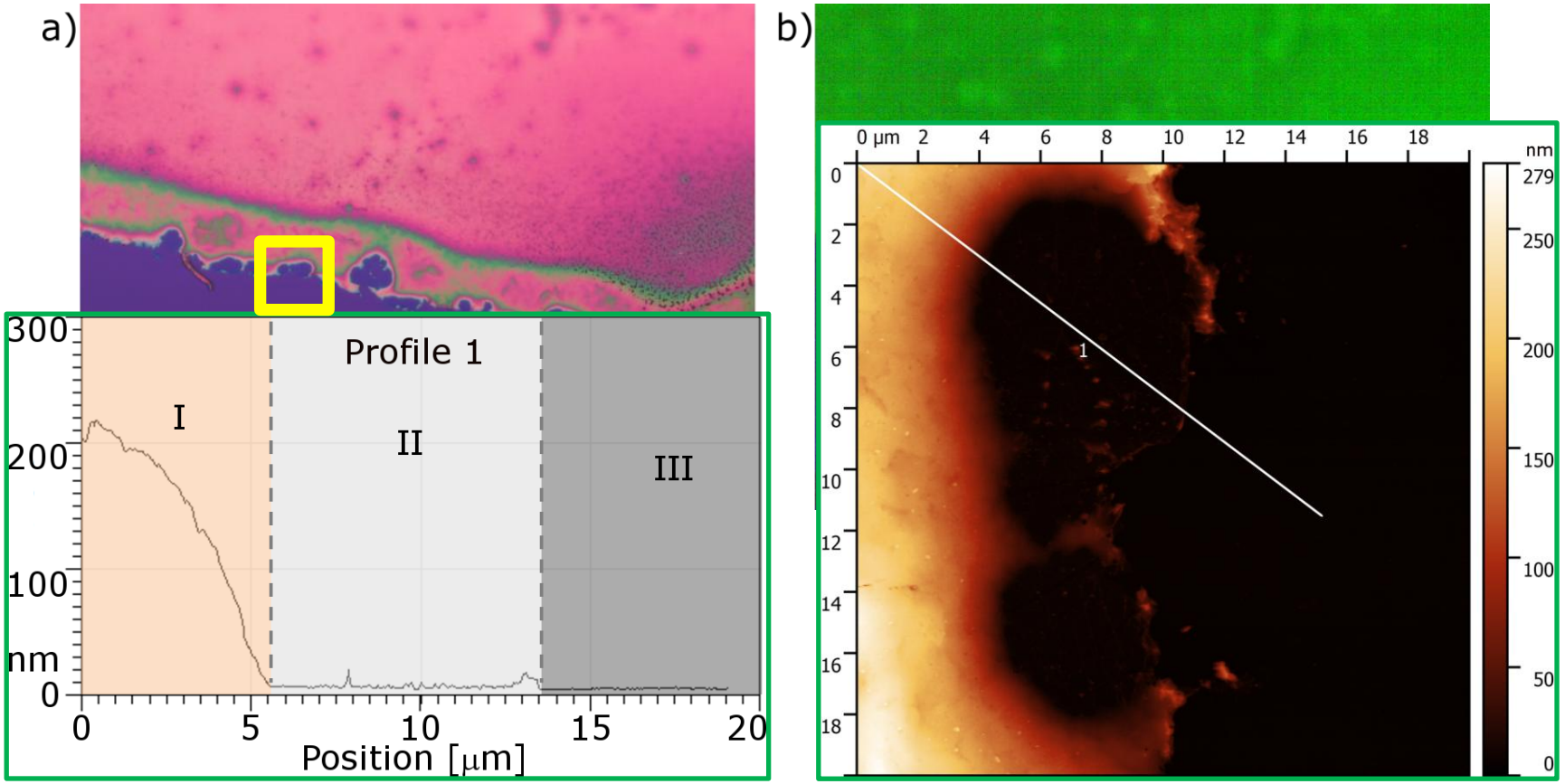


Ex filter: λ < 450nm
Em filter: λ > 450nm

Pip perovskite spincoated on graphene

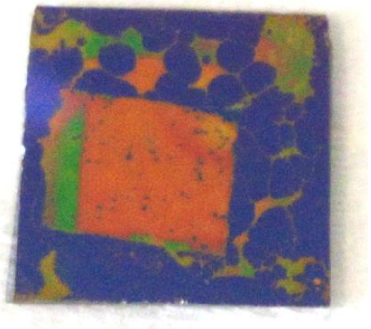
Selectivity of the assembly

AFM

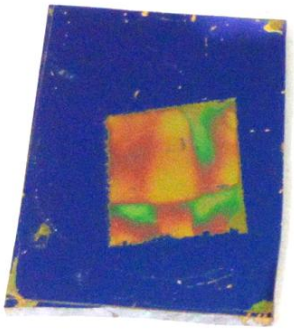


Selectivity of the assembly

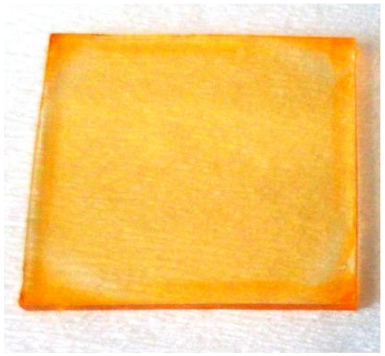
Si/SiO_2



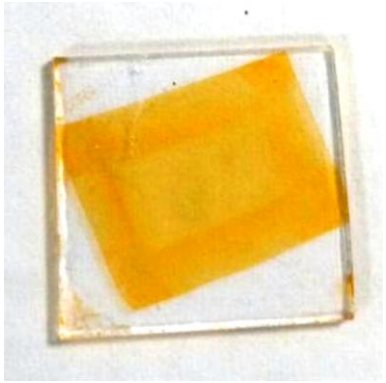
Gn @ Si/SiO_2



Gn @ endcapped Si/SiO_2

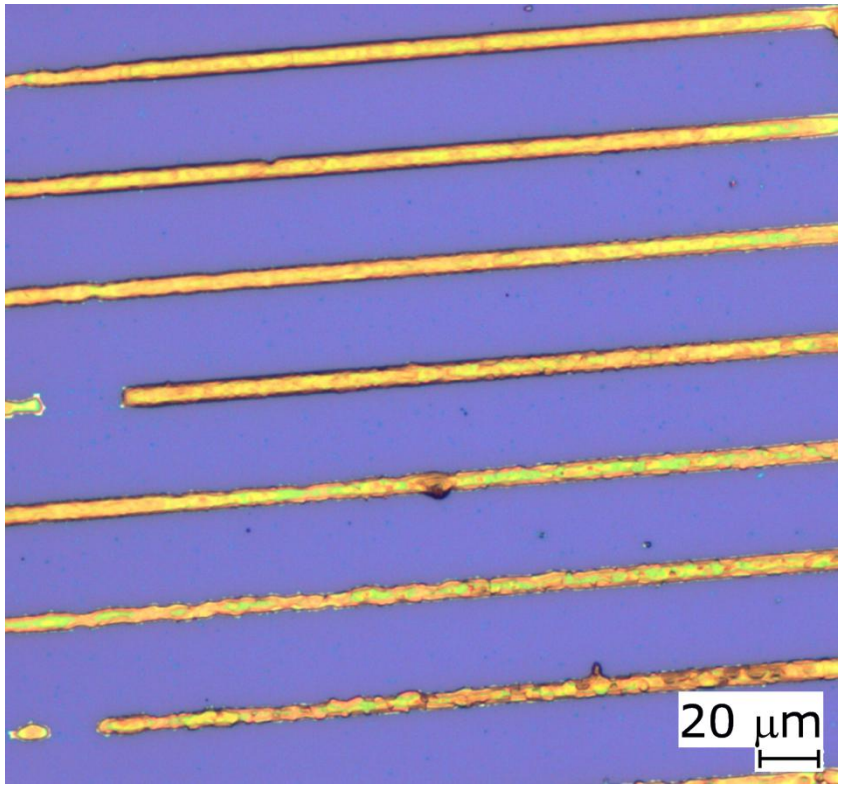


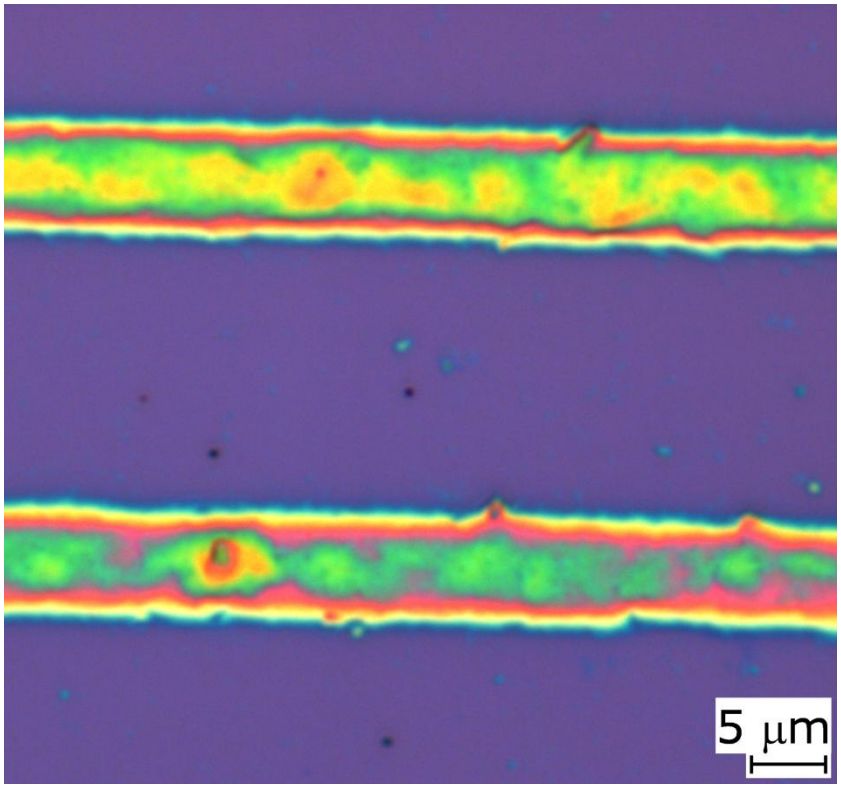
Oxygen plasma treated glass



Gn @ Glass

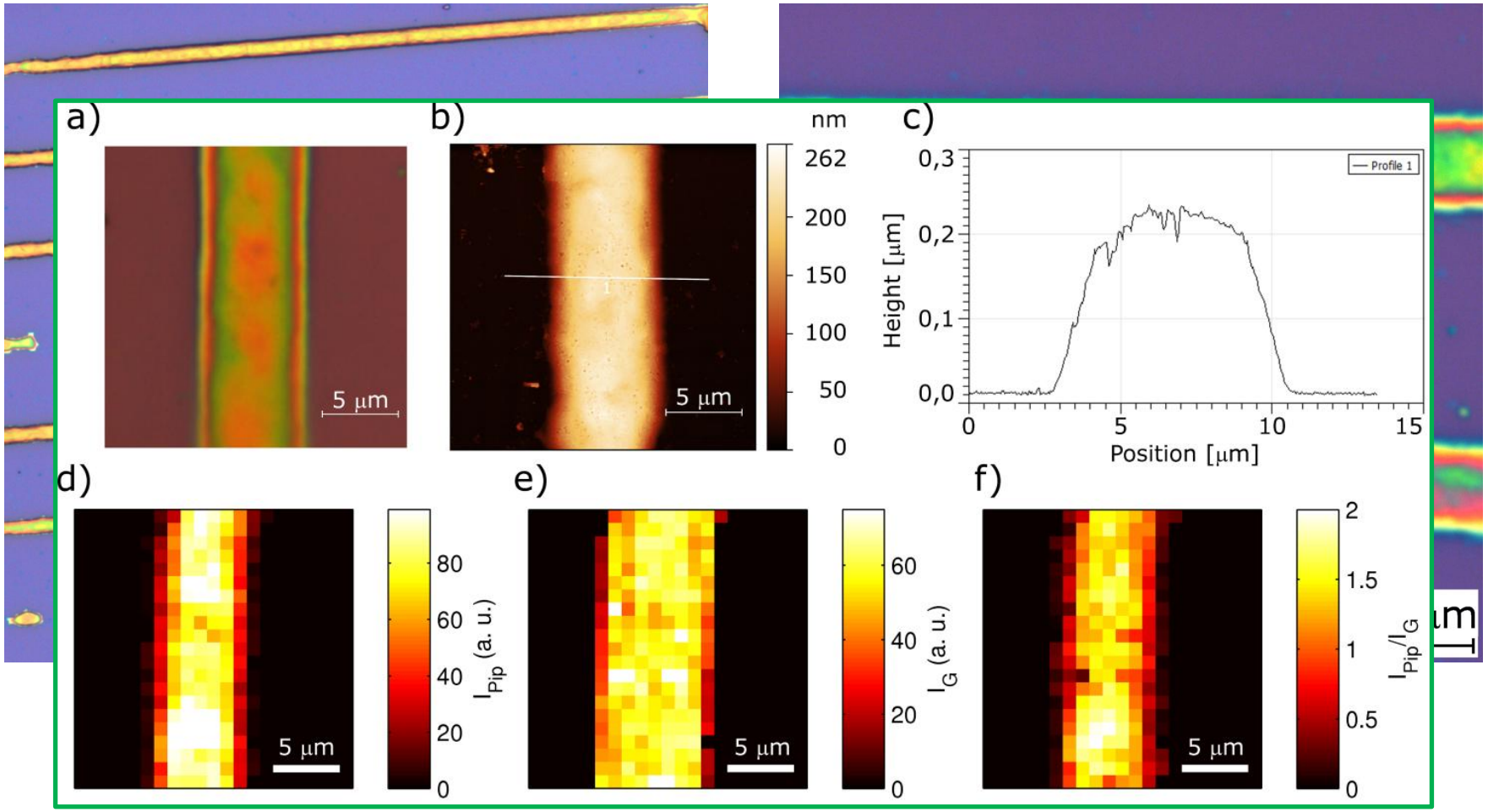
Selectivity of the assembly





Pip perovskite spincoated on photolitographically patterned graphene

Selectivity of the assembly



Summary

- Library of perovskites with characterization of their properties
- Preferential growth achieved by simple choice of precursors
- High spatial resolution of the selective self-assembly

Acknowledgements

- J. Heyrovsky Institute of Physical Chemistry of the Czech Academy of Sciences (Prague, Czech Republic)
  - Petr Kovaříček, Václav Valeš, Karolina Drogowska, Martin Kalbáč
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