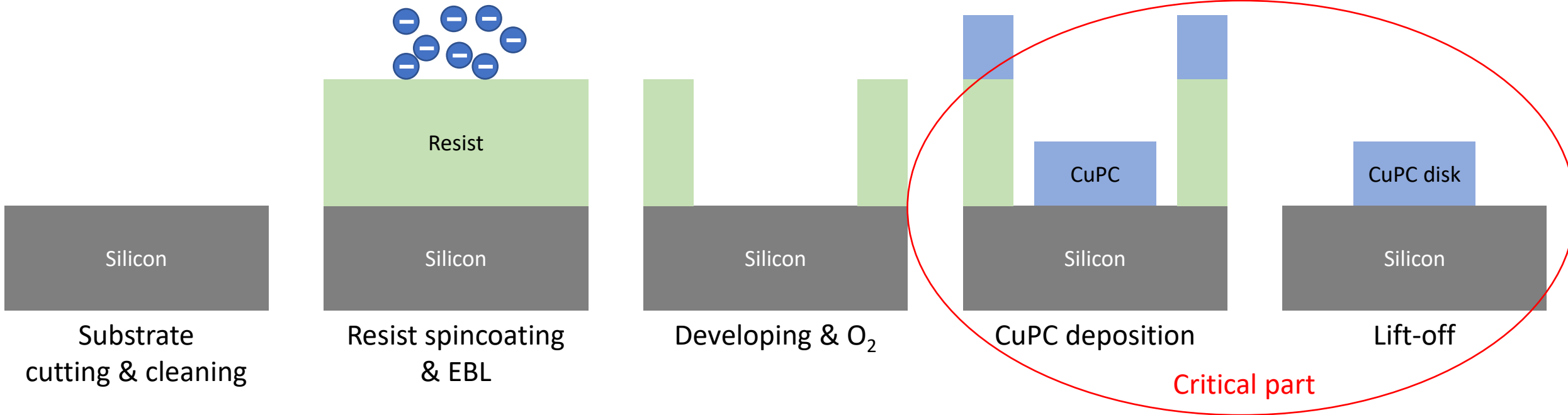


Fabrication of 5 μm disks from Copper phthalocyanines

PETER project

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Konečný, Jan Čechal, Tomáš Šikola

Fabrication of Copper phthalocyanines (CuPC) disks



(Acetone, IPA, ultrasound)

PMMA AR-P679.04

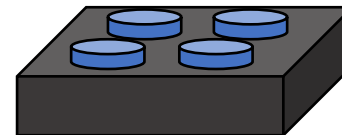
AR 600-56
+ IPA + DEMI
RIE-F (stripping
resist using O₂)

Deposition in UHV
complex
(sample space
limitation)

Acetone as PMMA
removal (CuPC
destroyed slowly)

Expected sample

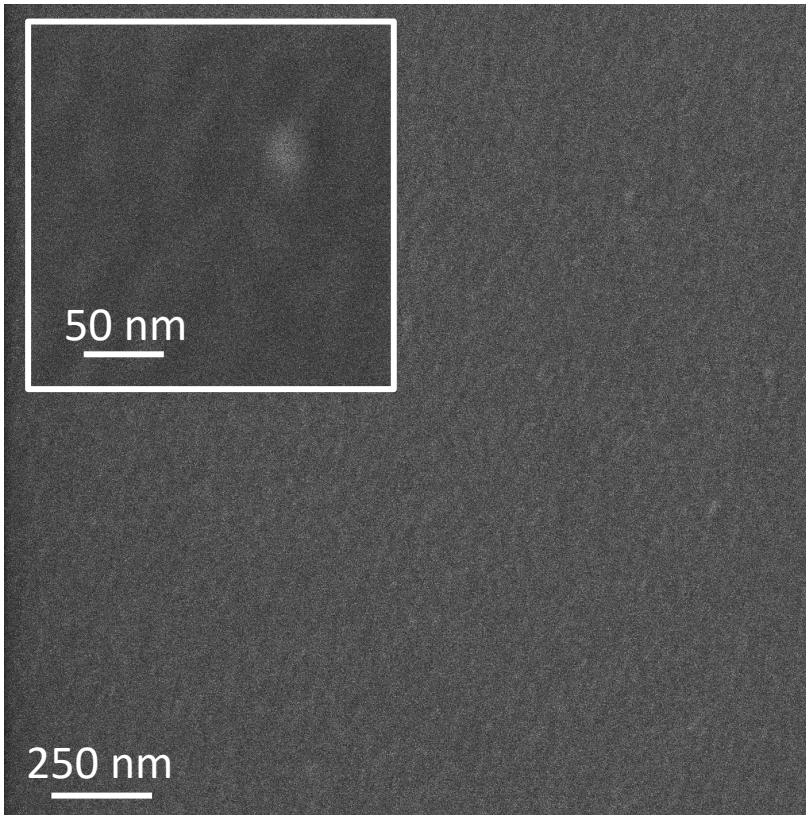
Diameter **5 μm**
Height **~100 nm**
Pitch **10 μm**



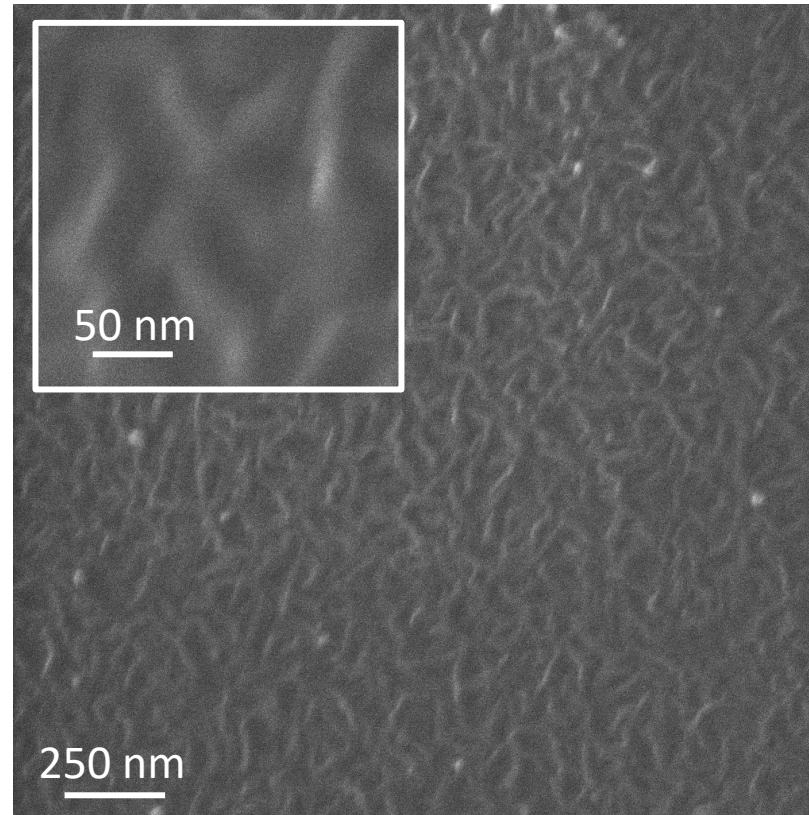
1 min and more
(no ultrasound)
For 7 nm CuPC film
Acetone 1 min OK

CuPC film surface

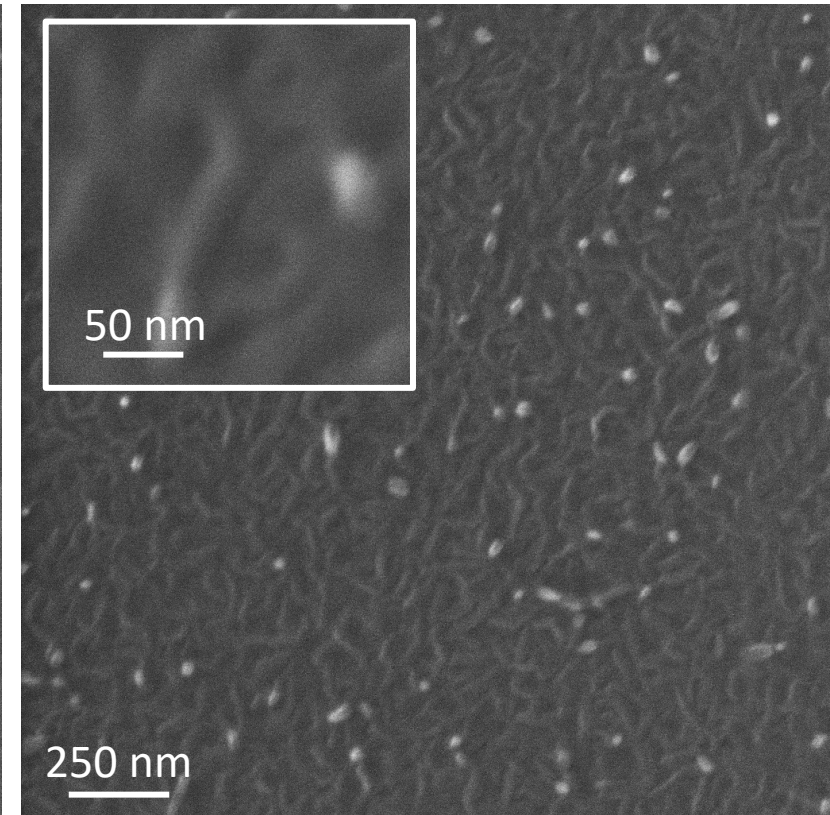
- Silicon substrate Si(100), double side polished, thickness $525 \pm 20 \mu\text{m}$



CuPC film (thickness $\sim 7 \text{ nm}$)
30.3.2021, 15 min, 440°C in crucible



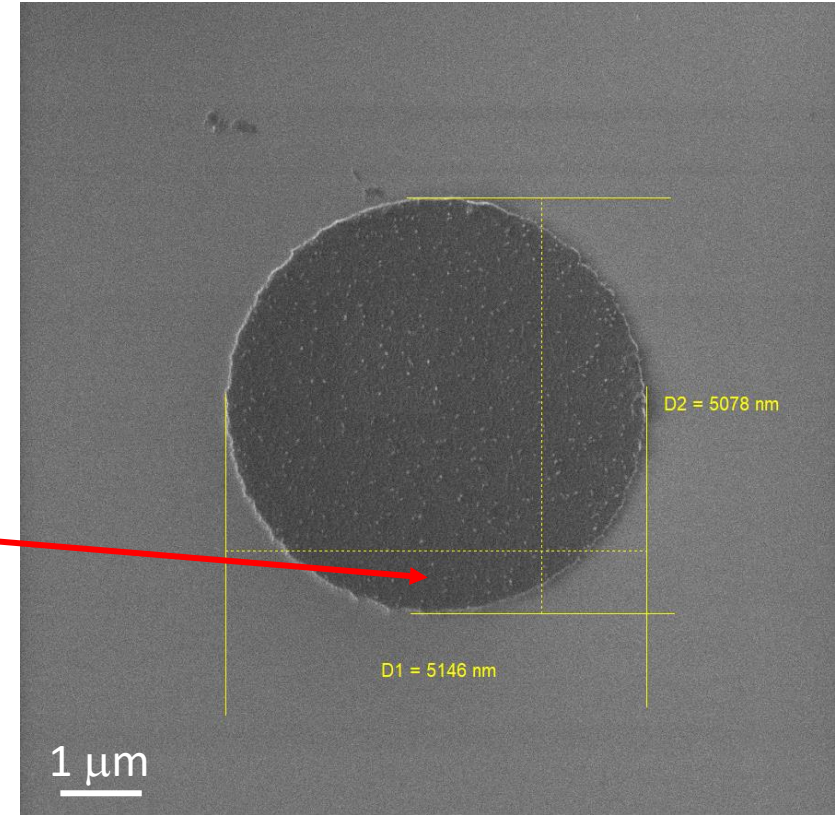
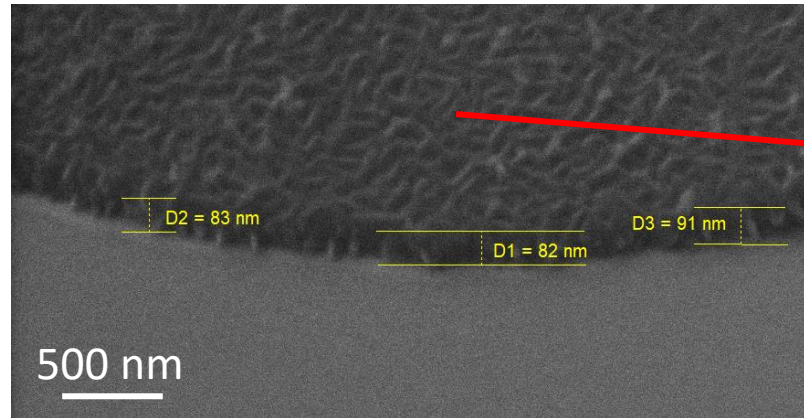
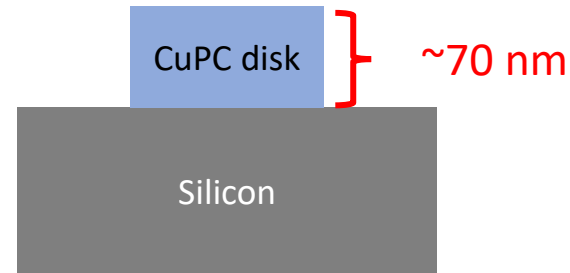
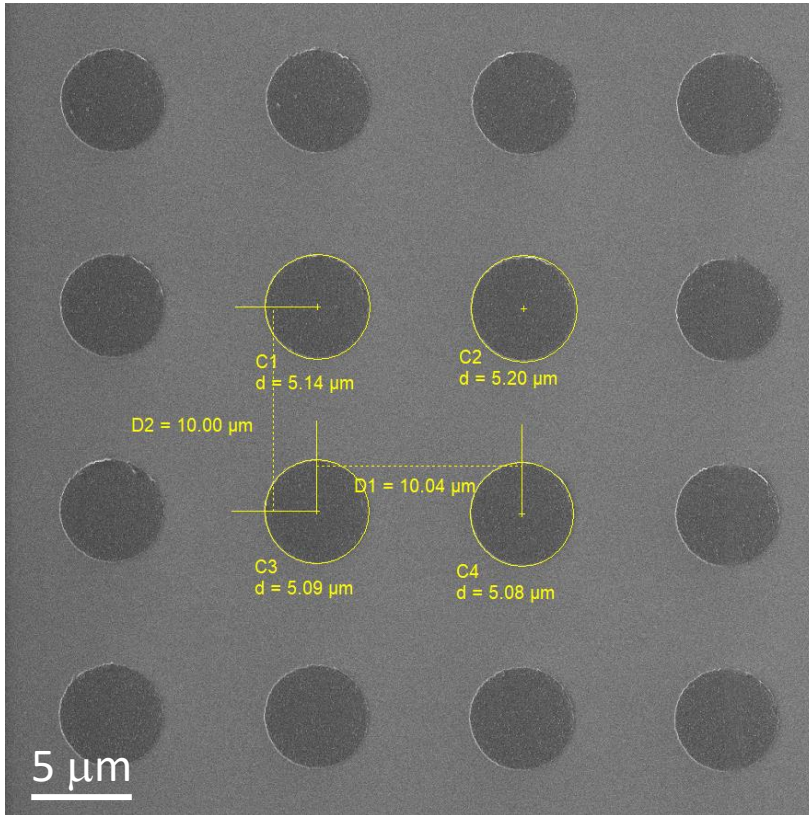
CuPC film (thickness $>70 \text{ nm}$)
4.-6.5.2021, 42 h, 460°C in crucible



= Surface of CuPC disk (thickness $\sim 70 \text{ nm}$)
4.-6.5.2021, 42 h, 460°C in crucible

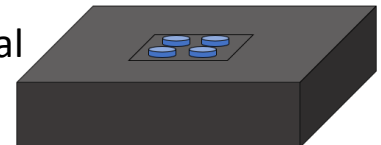
CuPC disks

- Silicon substrate (10x10 mm²), PMMA AR-P 679.04, CuPC deposition (42 hours), Lift-off using Acetone (60 s)



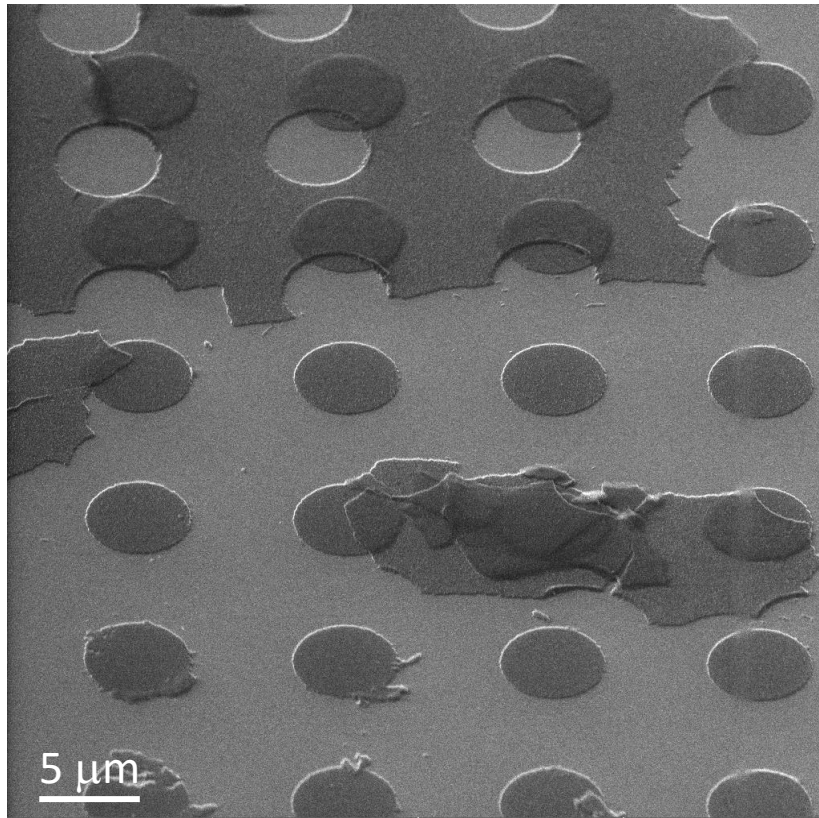
Tilt 55°

CuPC disks in central area 3x3 mm²

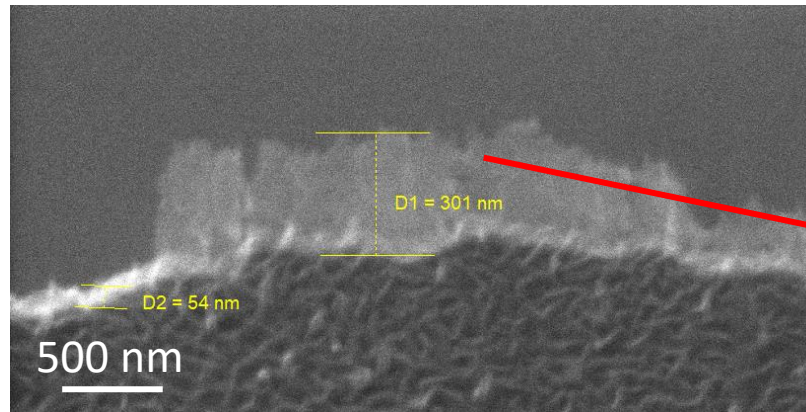
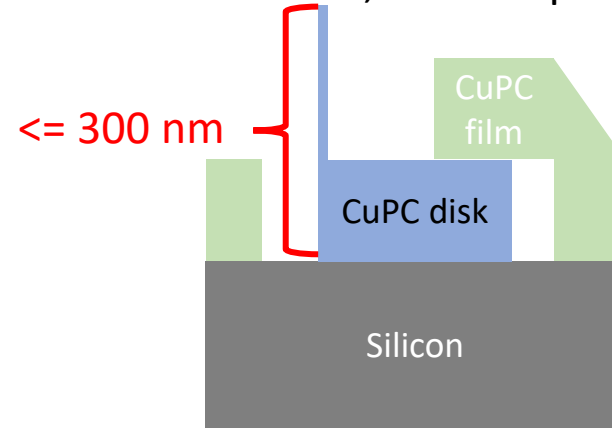


CuPC disks (areas with not ideal Lift-off)

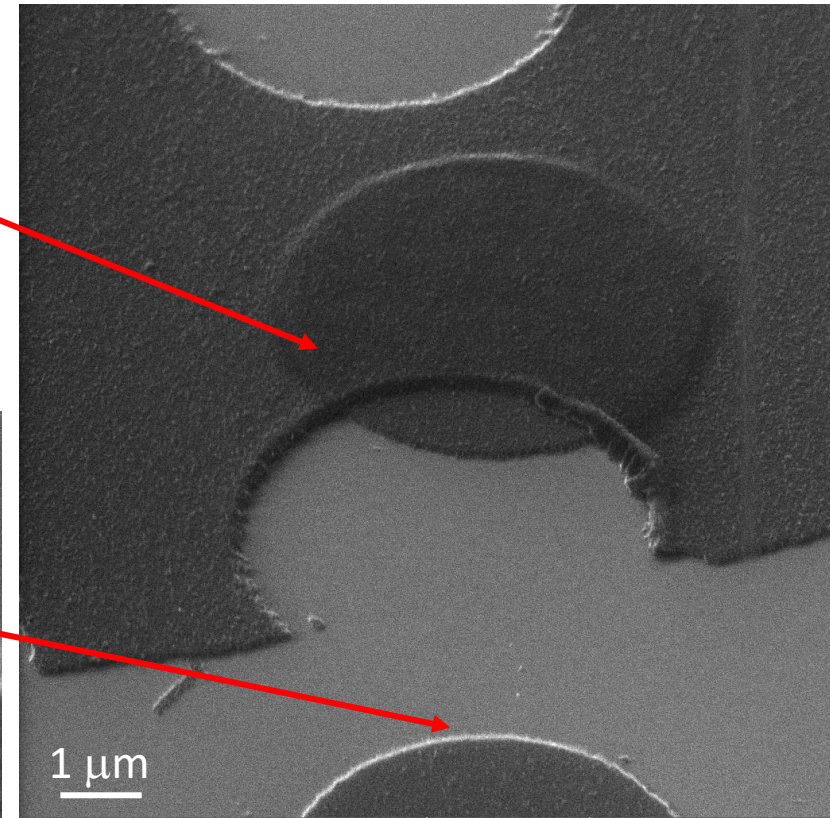
- Silicon substrate (10x10 mm²), PMMA AR-P 679.04, CuPC deposition (42 hours), Lift-off using Acetone (60 s)



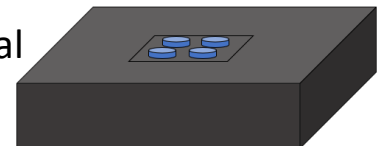
Tilt 55°



Tilt 55°



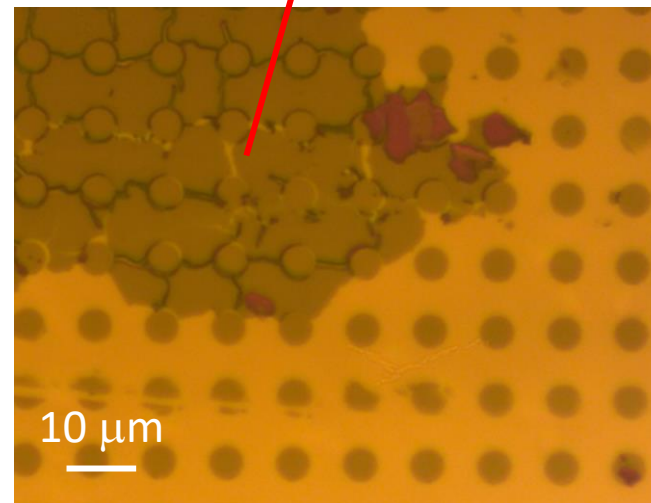
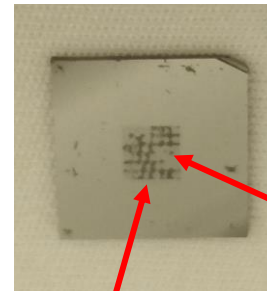
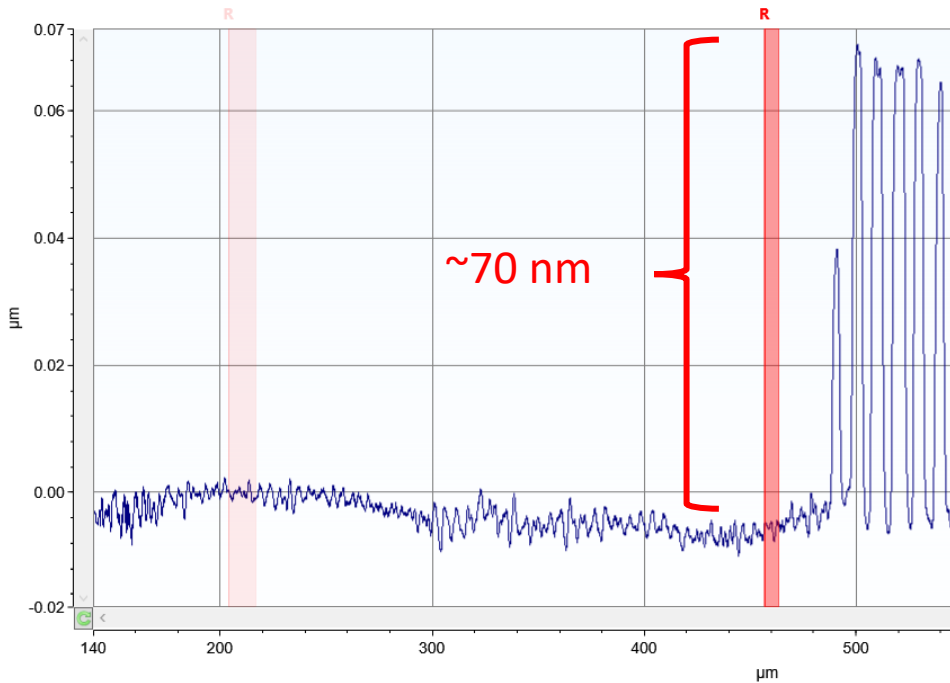
CuPC disks in central area 3x3 mm²



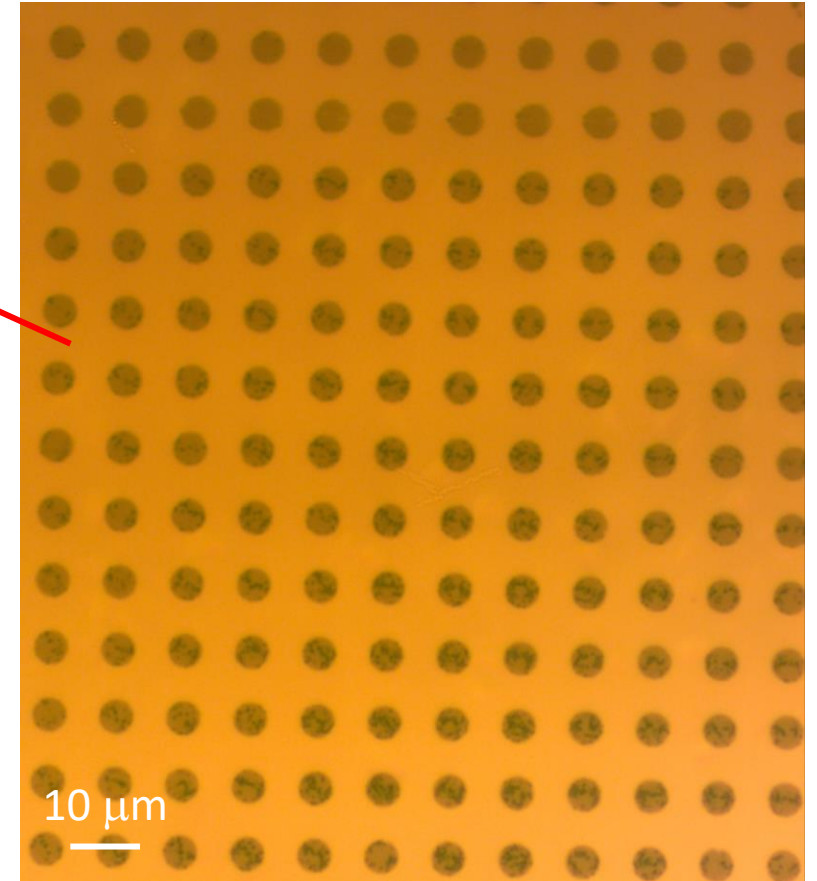
CuPC disks (Profilometry, optical images)

- Silicon substrate (10x10 mm²), PMMA AR-P 679.04, CuPC deposition (42 hours), Lift-off using Acetone (60 s)

Microscopic images captured using yellow filter



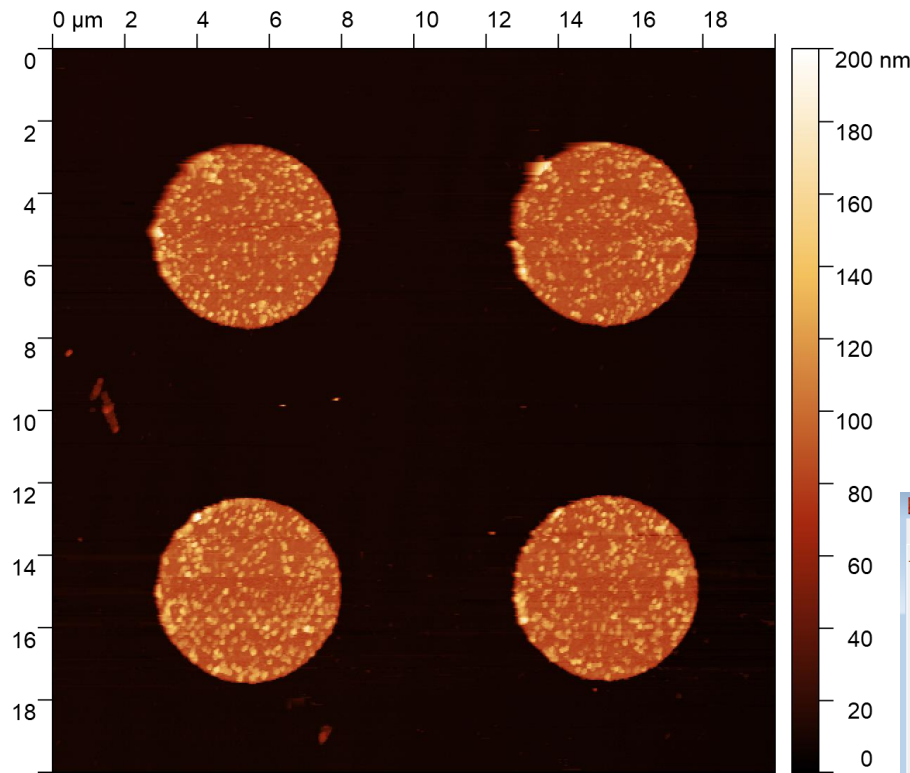
CuPC excess (no more than 20-30 %)



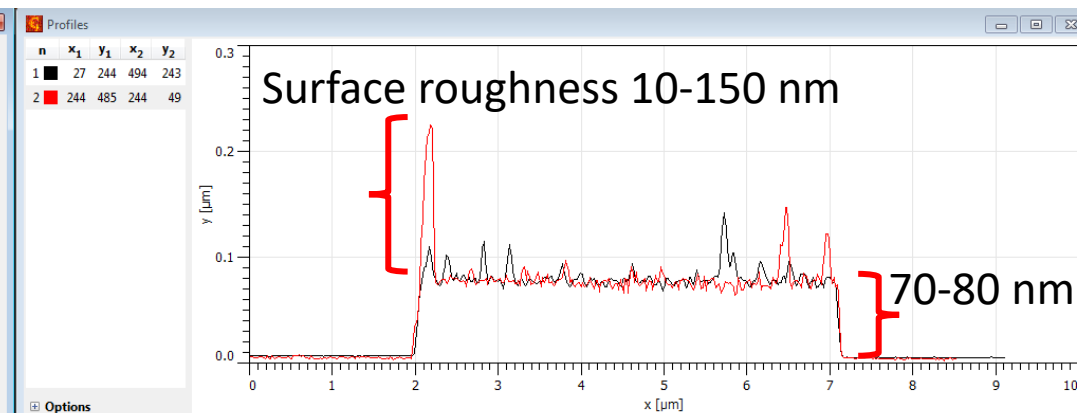
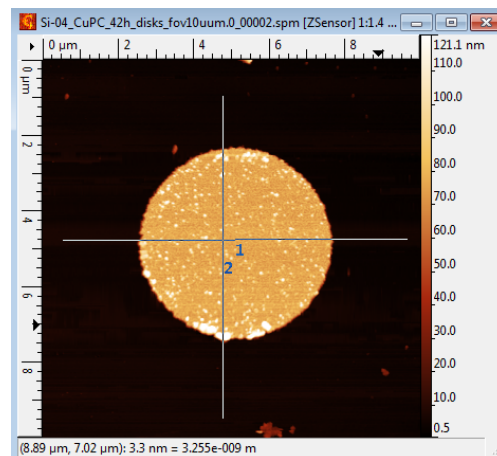
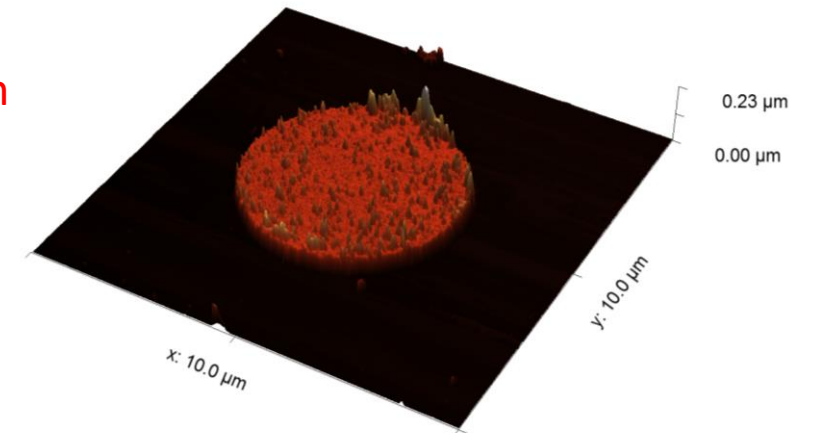
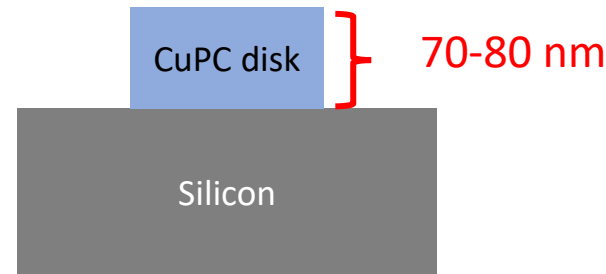
Perfect CuPC disks

CuPC disks (AFM topography)

- Silicon substrate (10x10 mm²), PMMA AR-P 679.04, CuPC deposition (42 hours), Lift-off using Acetone (60 s)

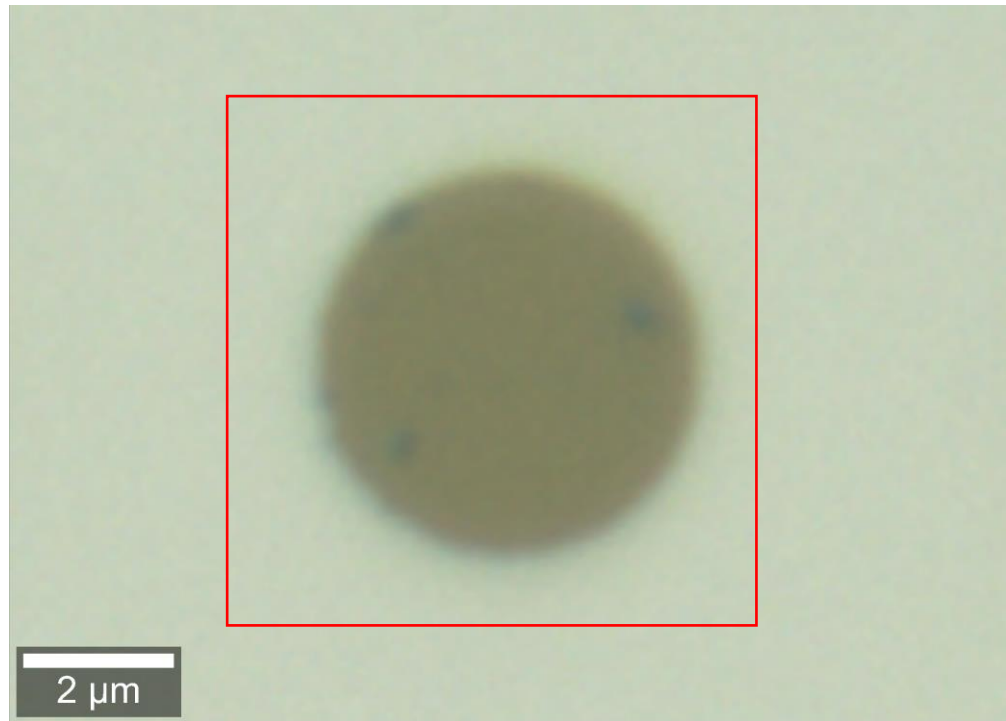


20x20 μm² scan

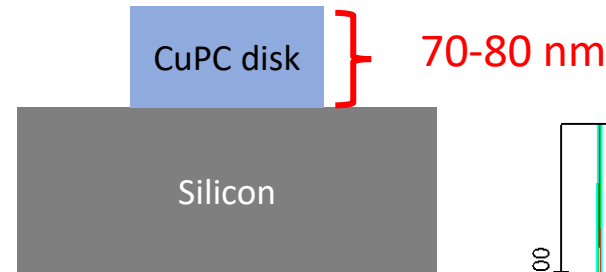


CuPC disks (Raman spectroscopy)

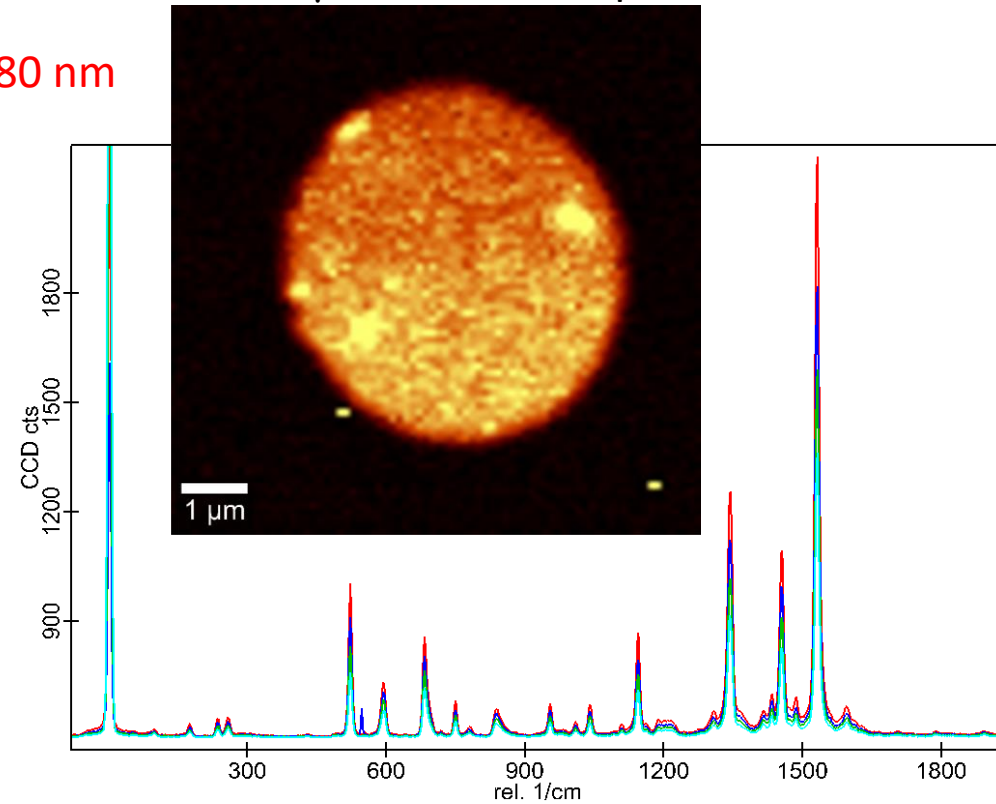
- Silicon substrate (10x10 mm²), PMMA AR-P 679.04, CuPC deposition (42 hours), Lift-off using Acetone (60 s)



Optical image



8x8 μm² Raman map



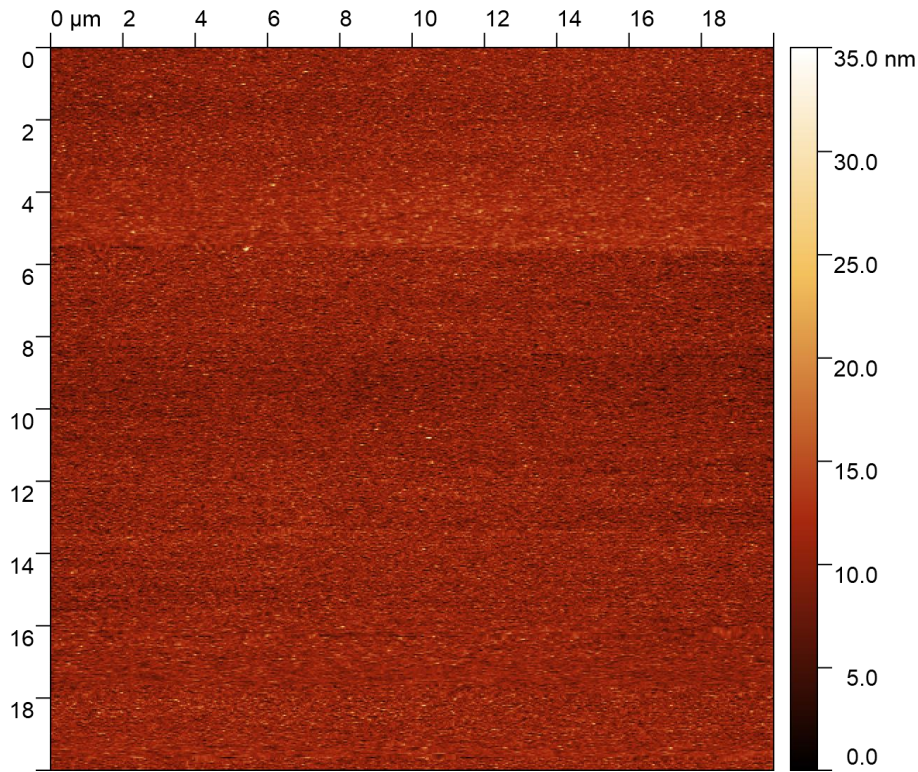
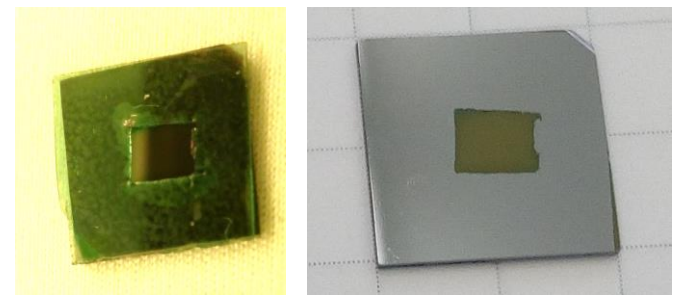
Single Raman spectra from different disk area

Peaks in good agreement with β phase of CuPC

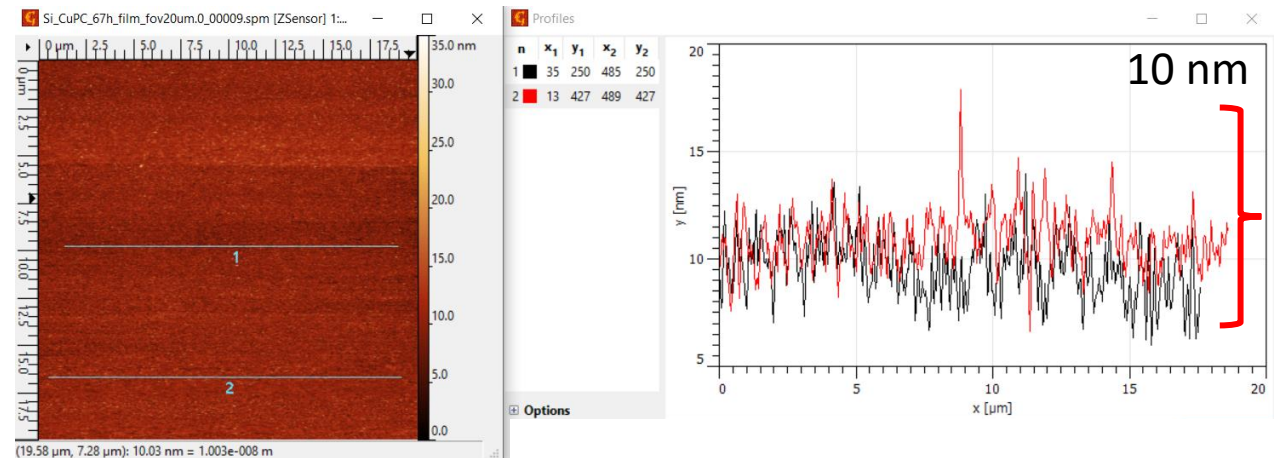
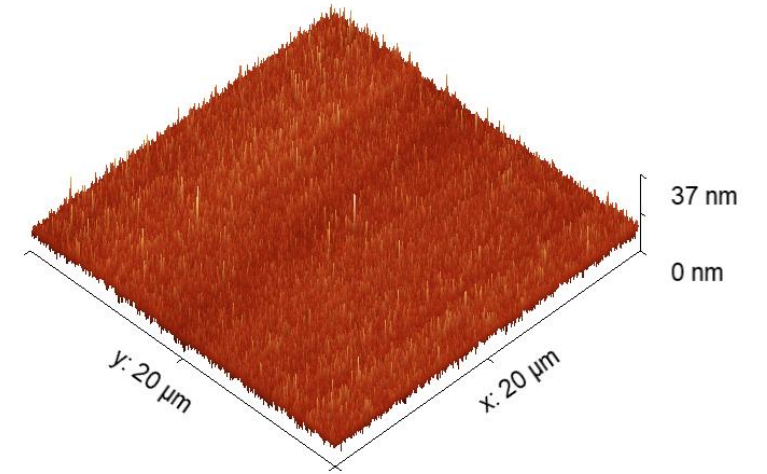
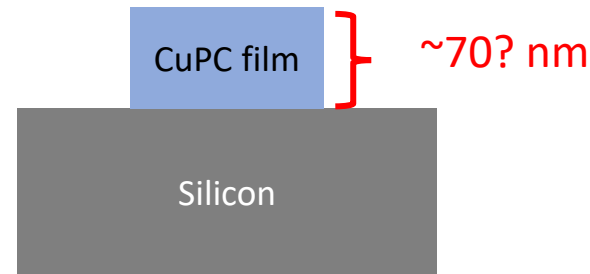
e.g. Ghorai et al. (Chattopadhyay), J. Phys. Chem. C 2017, 121, 11, 6323–6328, <https://pubs.acs.org/doi/abs/10.1021/acs.jpcc.6b10620>

CuPC film (AFM topography)

- Silicon substrate (10x10 mm²), deposition mask from double-sided Kapton tape, CuPC deposition (67 hours)

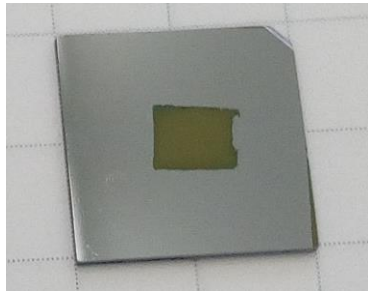


20x20 μm² scan



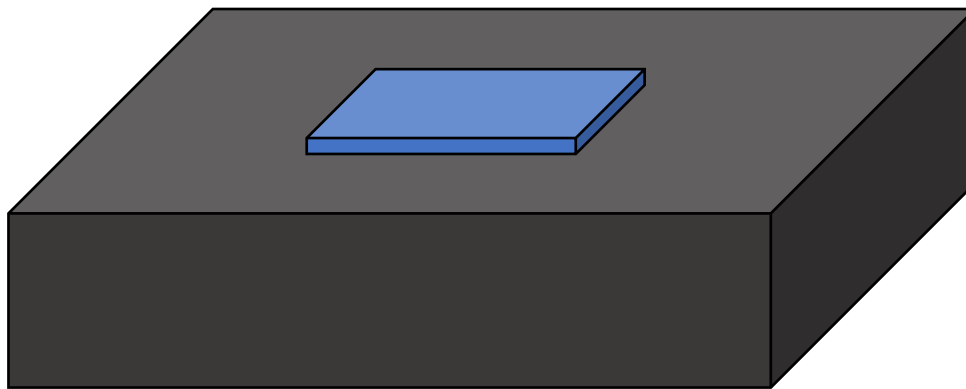
Fabrication finished

- Fabricated 2 samples with silicon substrate and appropriate thickness of CuPC film/disks

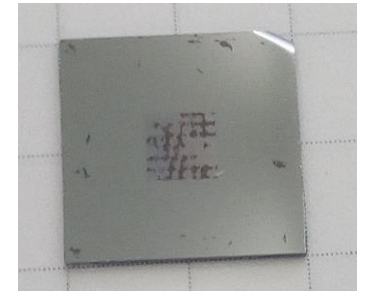


DONE

Sample (III.)

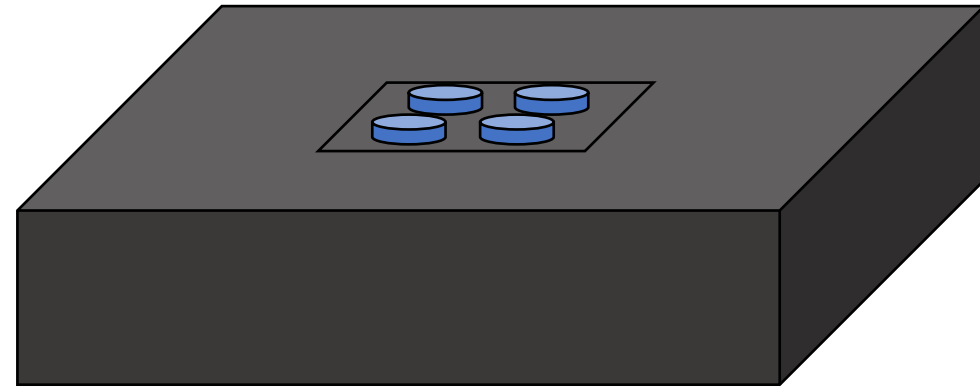


CuPC film in **central area $3 \times 3 \text{ mm}^2$**
 \Rightarrow **$2.8\text{-}3.0 \times 3.3\text{-}3.5 \text{ mm}^2$**
Thickness $\sim 100 \text{ nm} \Rightarrow$ **$\sim 70 \text{ nm}$**
Si/Fused silica substrate **$10 \times 10 \times 0.5 \text{ mm}^3$**



DONE

Sample (IV.)



CuPC disks in **central area $3 \times 3 \text{ mm}^2$**
Diameter $5 \mu\text{m}$, Pitch $10 \mu\text{m}$
Height $\sim 100 \text{ nm} \Rightarrow$ **$\sim 70 \text{ nm}$**
Si/Fused silica substrate **$10 \times 10 \times 0.5 \text{ mm}^3$**