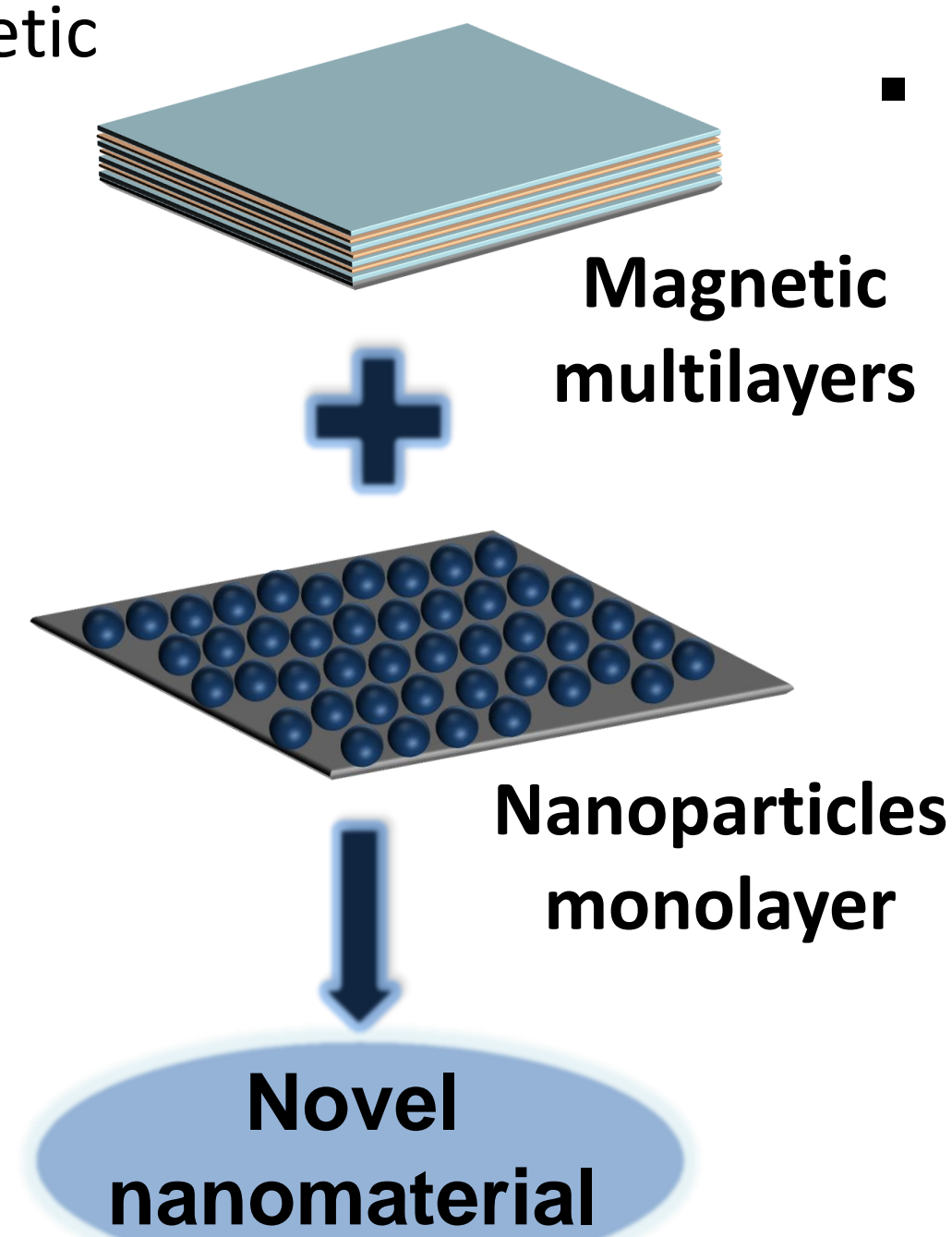
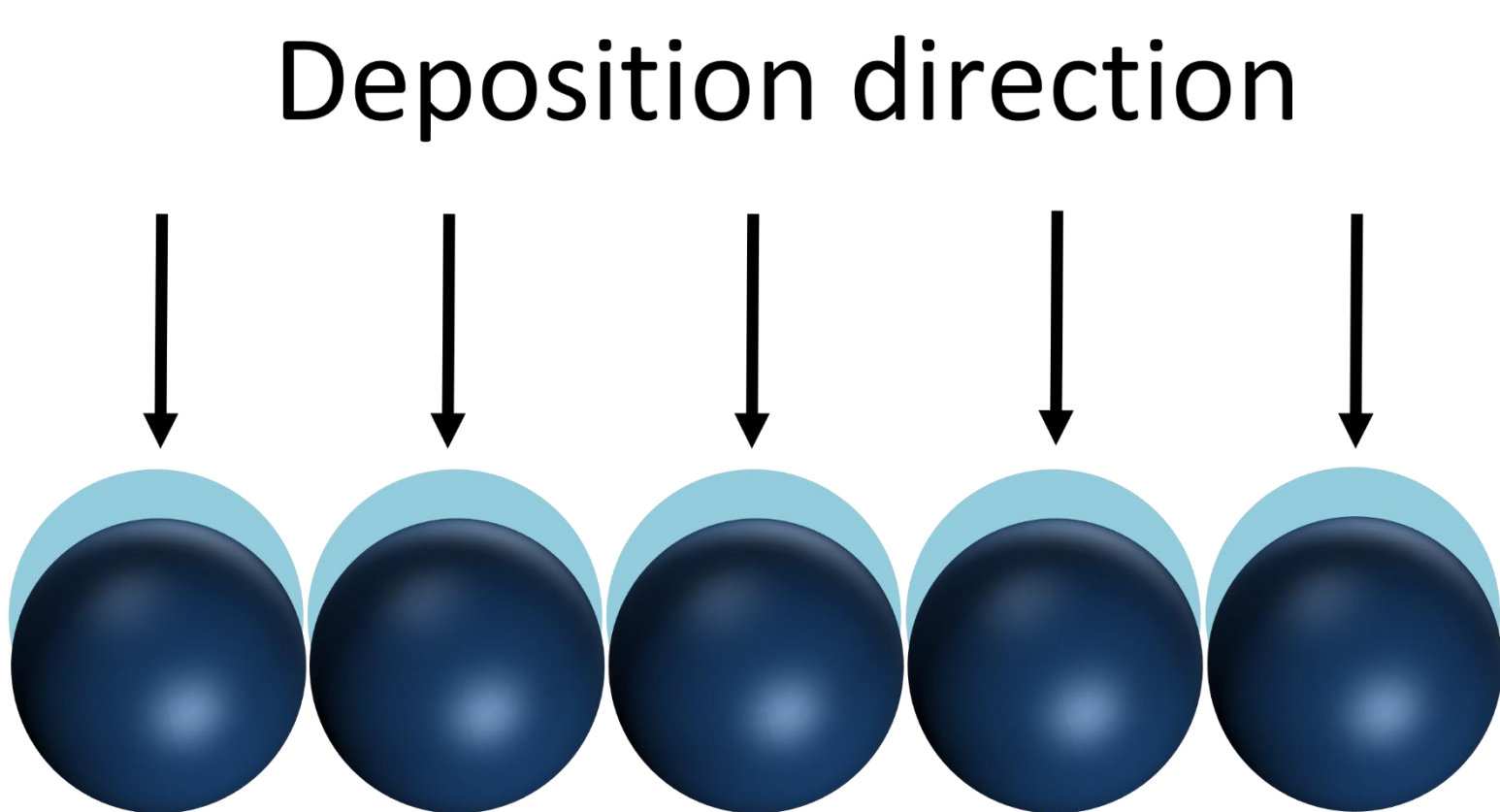


# Tuning shape-imposed anisotropy via magnetic multilayers on self-organized nanospheres

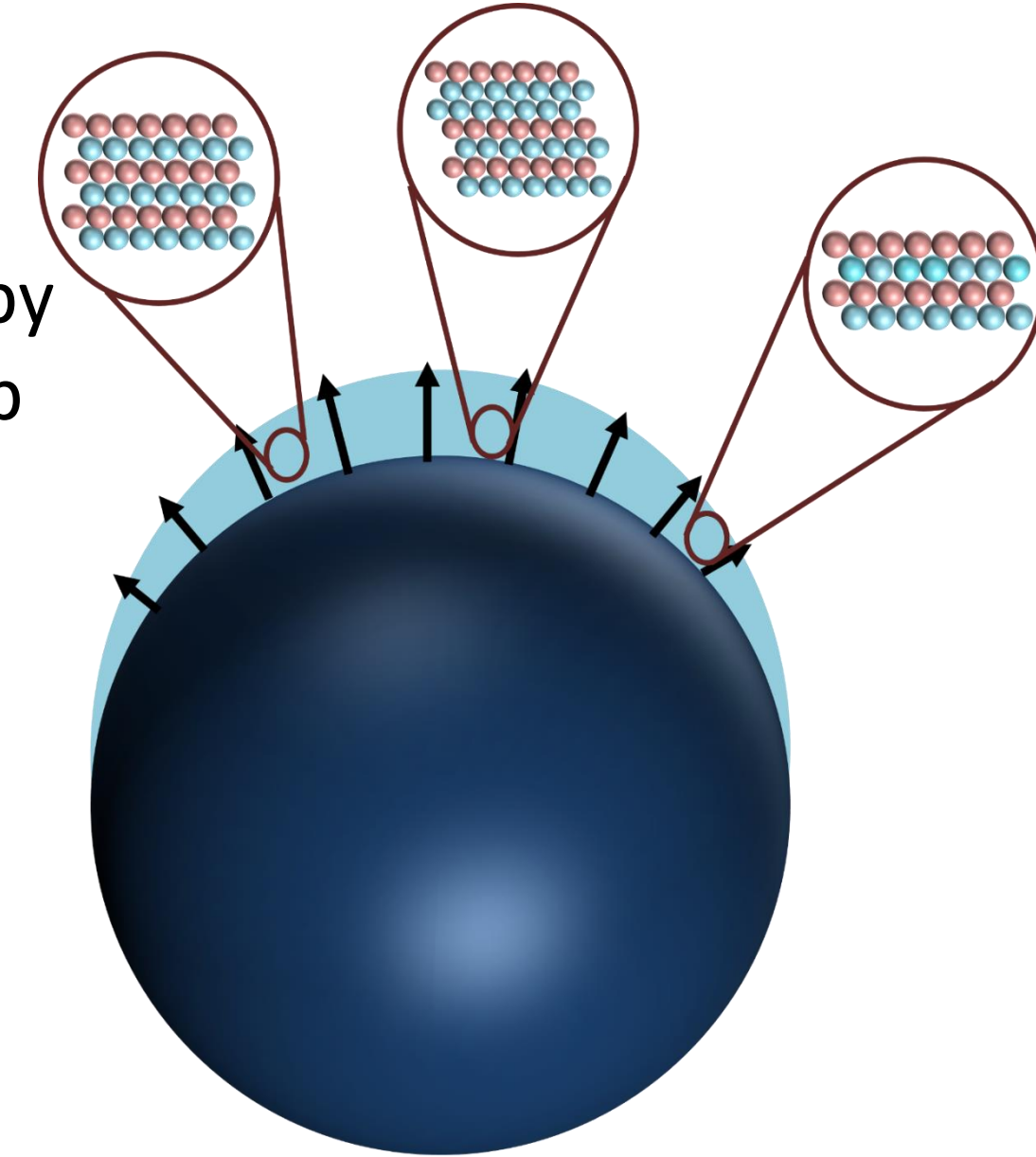
A. Qdemat, E. Kentzinger, J. Buitenhuis, S. Pütter, M. H. Hamed, C. B. Meinke, O. Petravic, and T. Brückel

## Introduction & Motivation

- Investigate the influence of curved surfaces on the magnetic thin film properties
- Tuning shape-imposed anisotropy
- Study the NP size dependence in the magnetization reversal of the magnetic multilayers

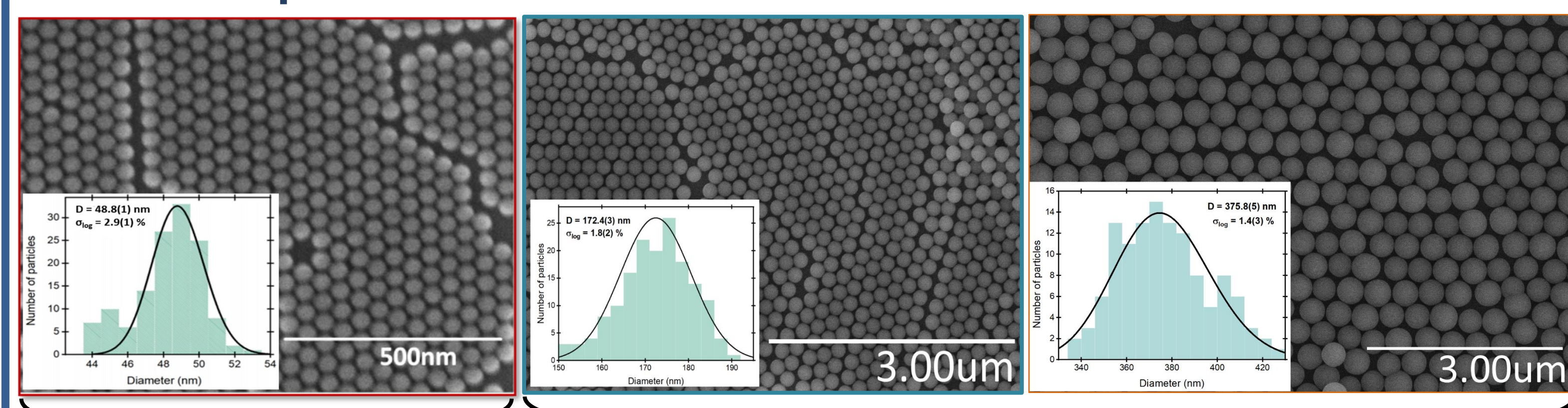


- Appealing properties arise from the combination of properties at different length scales
- Different thickness levels
  - radial symmetric anisotropy orientation across the cap
- Control magnetism reversal
  - improve applications
  - data storage, recording media, biomedical technology



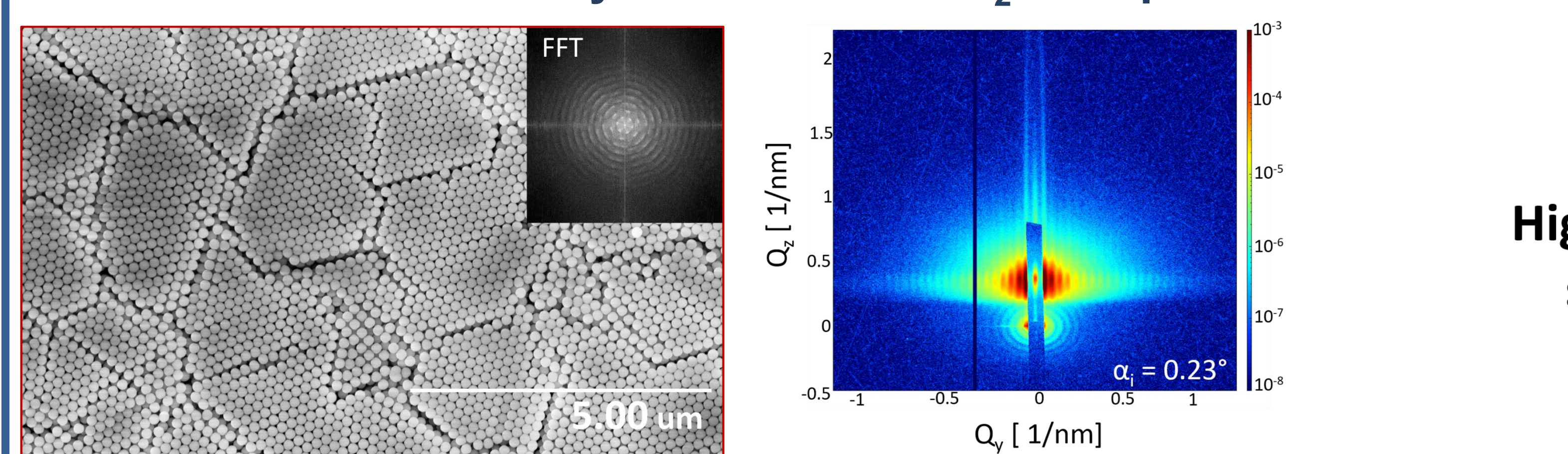
## ordered monolayer of nanoparticles

### Silica Nanoparticles



- Grafted with  $C_{18}H_{38}O$
- Dispersed in Toluene
- Non-grafted
- Dispersed in Ethanol

### Towards ordered monolayer of 200 nm $SiO_2$ nanoparticles



### Monolayer formation (50 nm)

Local characterization by SEM

Disordered structures

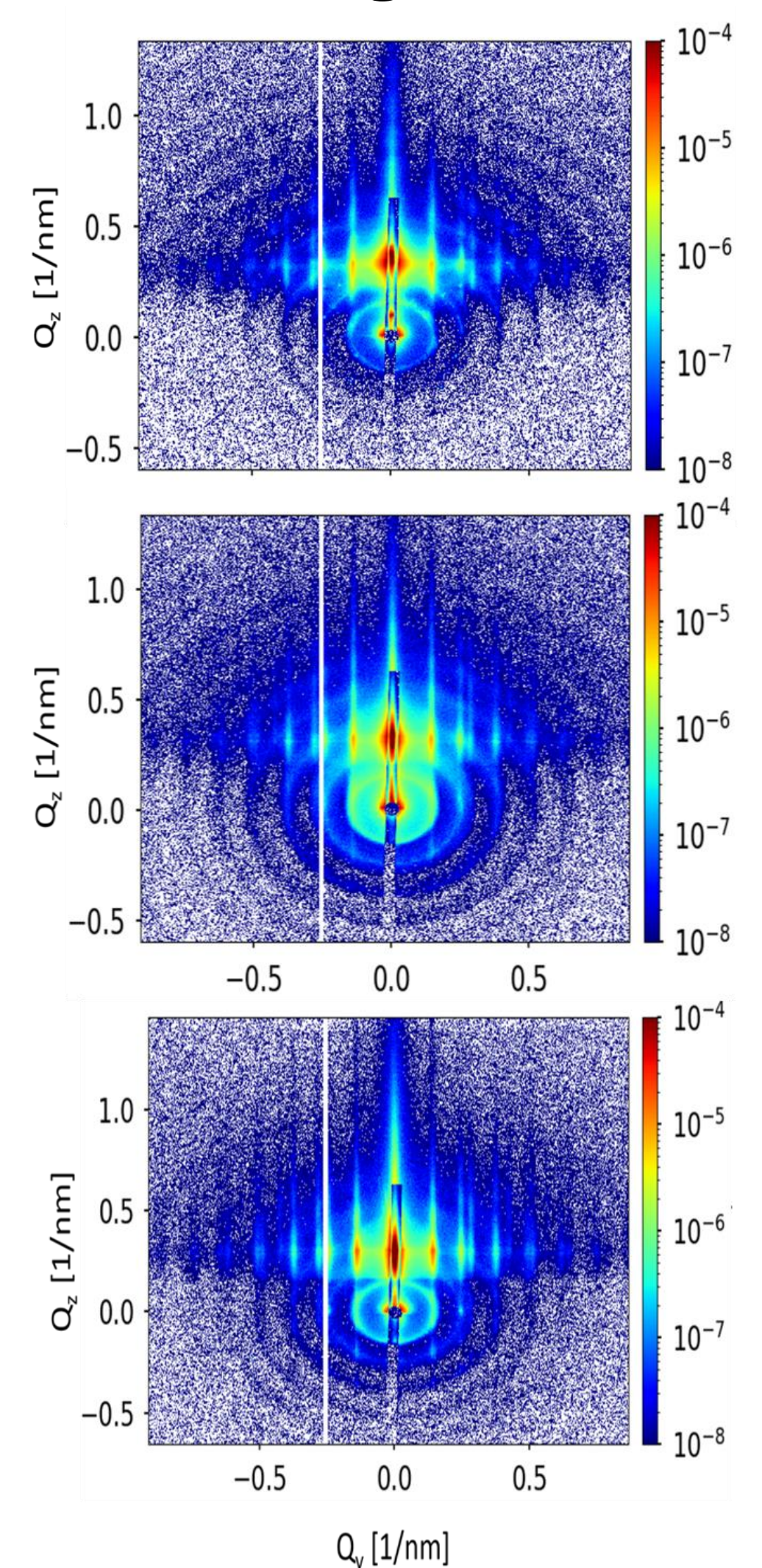
Highly ordered structures

Simple drop-casting

Stearyl alcohol assistance

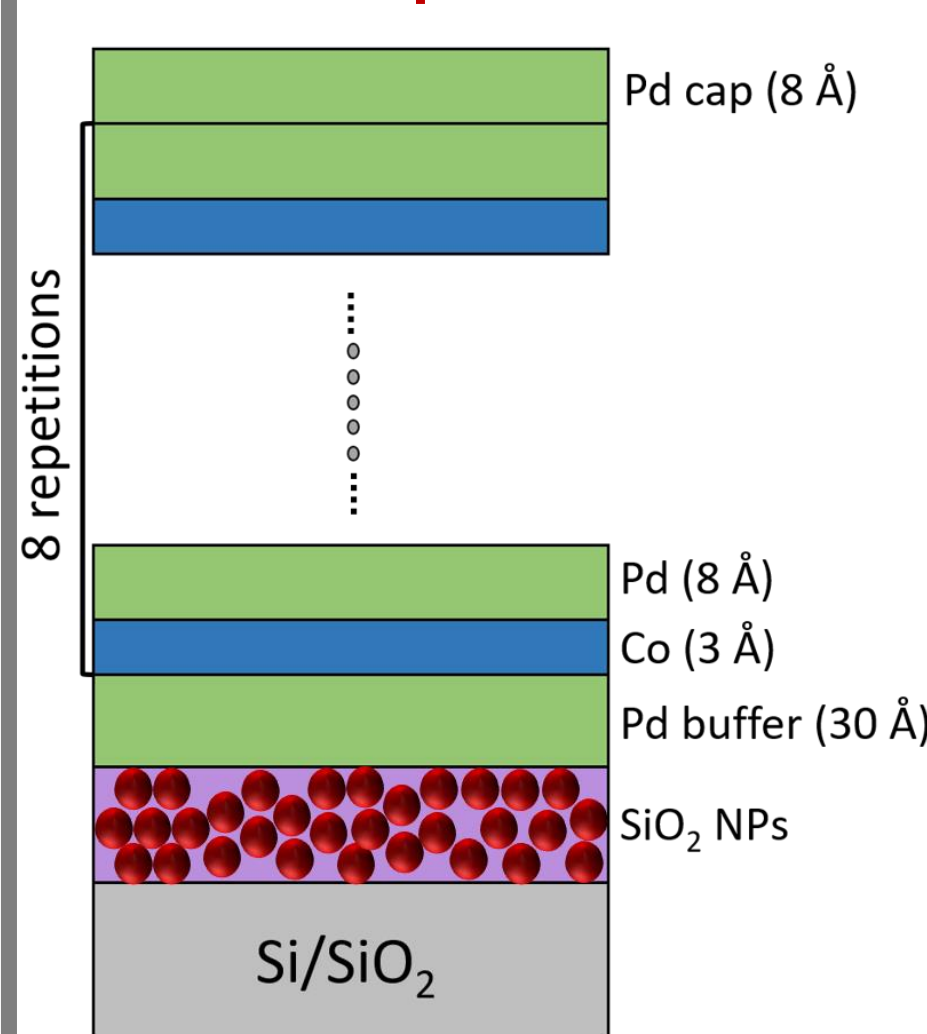
annealing

### GISAXS @ GALAXI

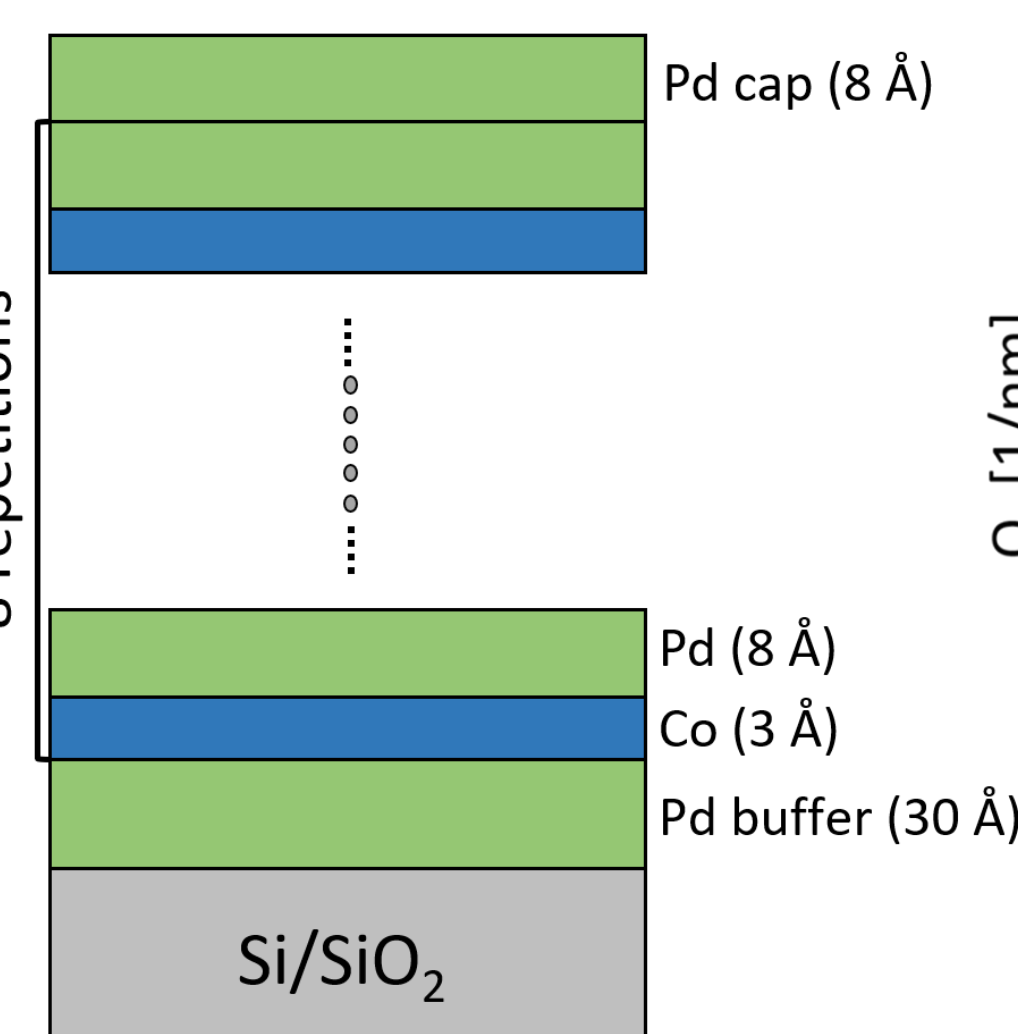


## Co/Pd multilayers on $SiO_2$ nanospheres

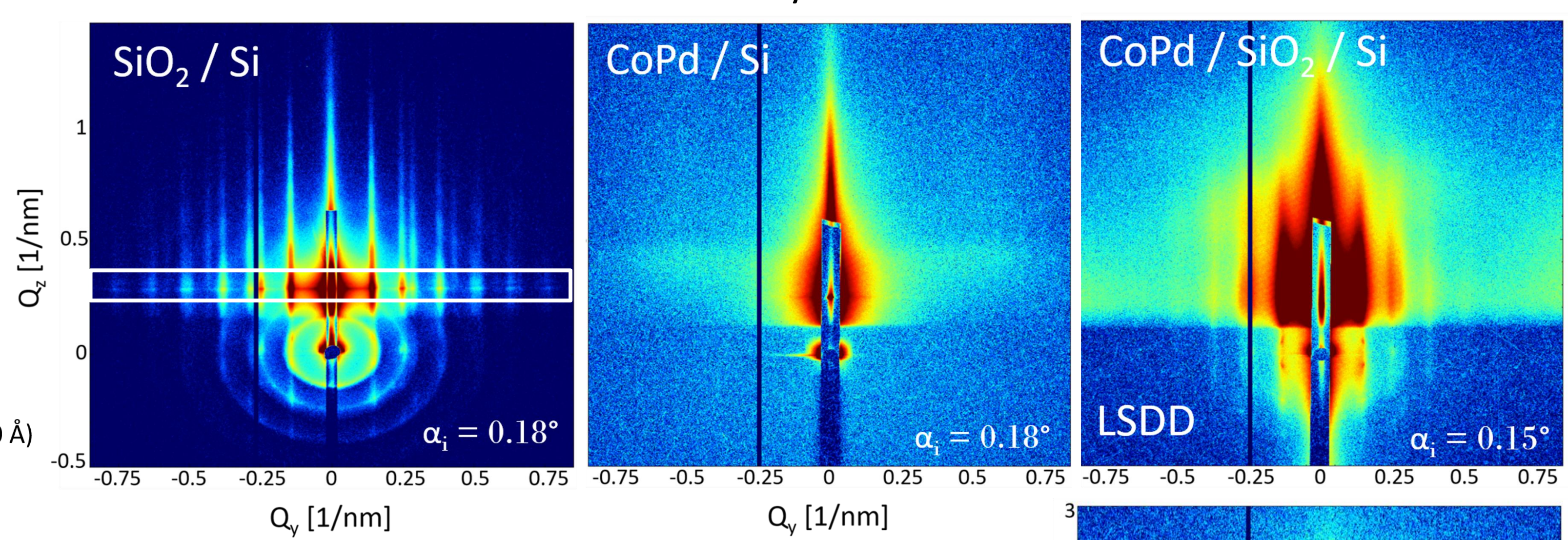
### Magnetic multilayers on nanospheres



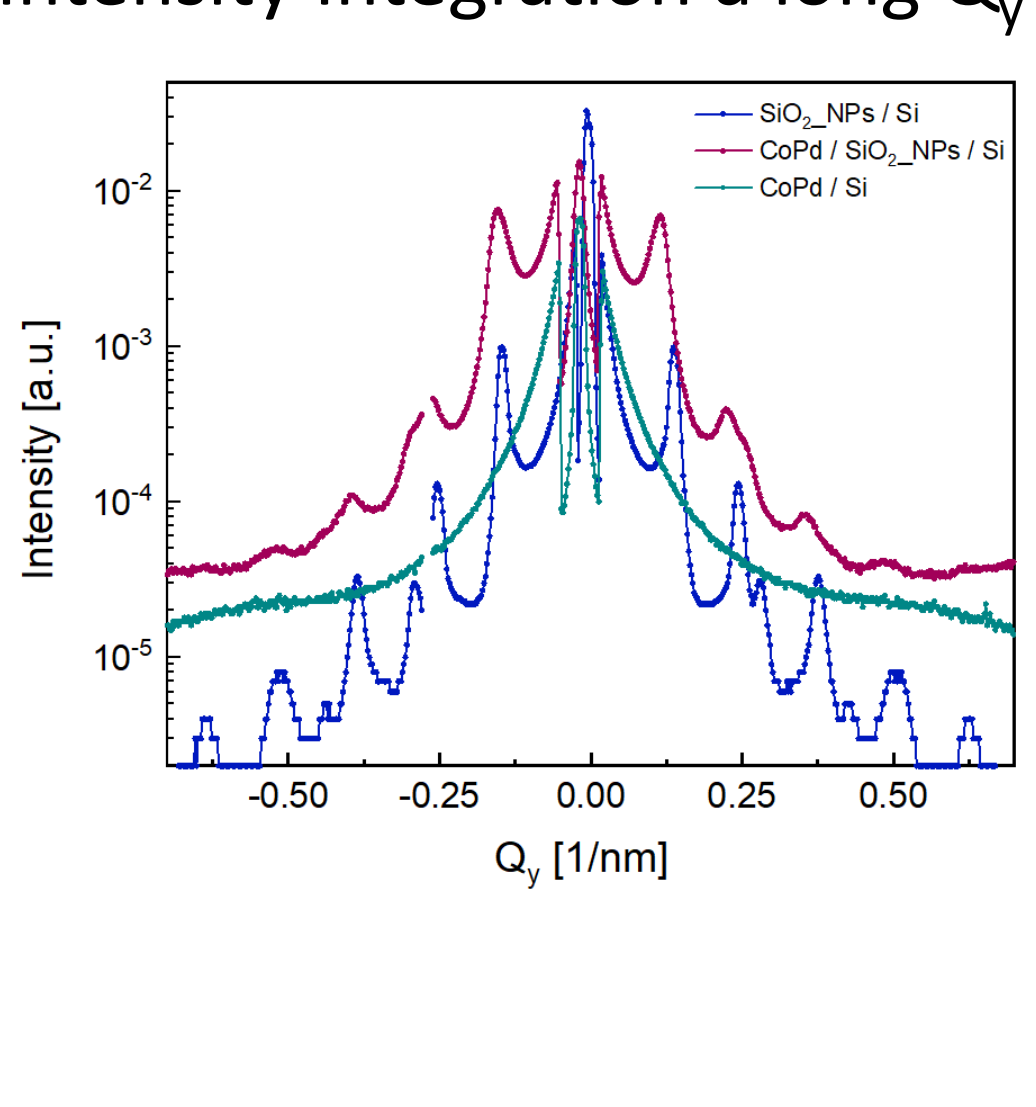
### Magnetic multilayers on Si substrate



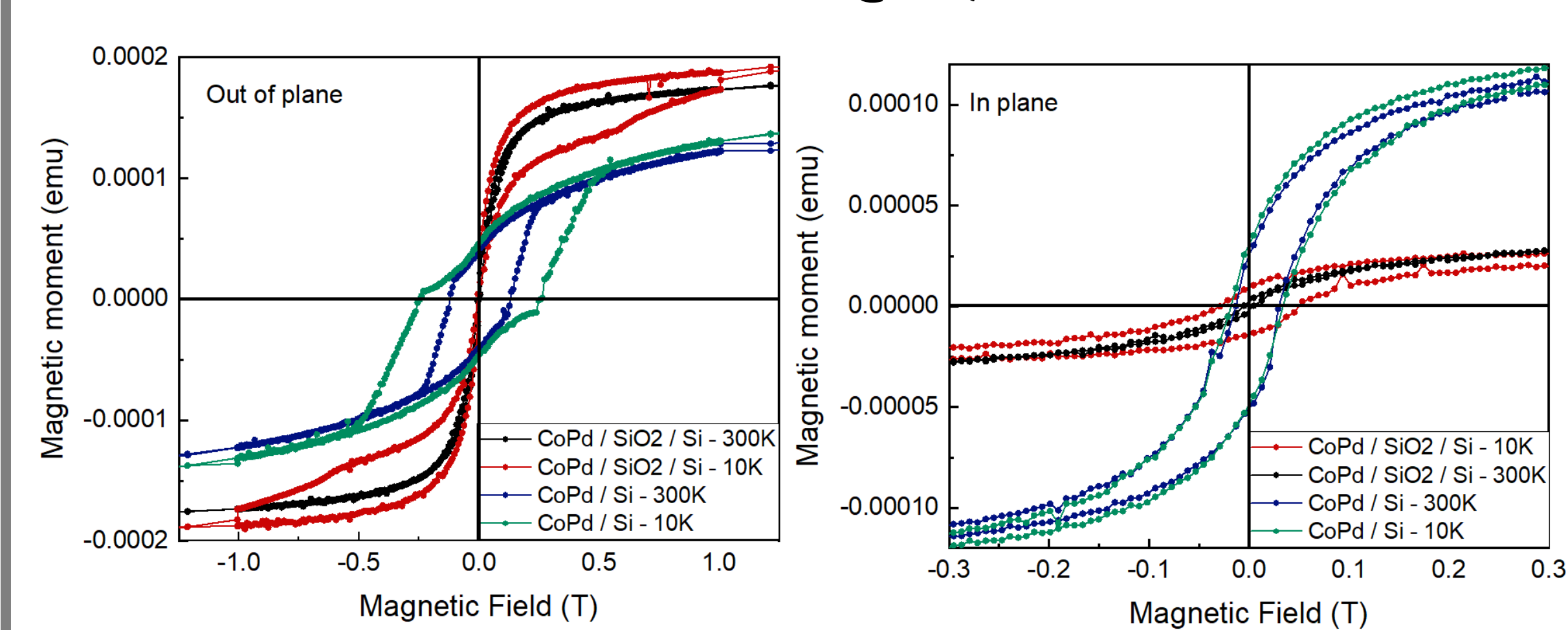
### Global characterization by GISAXS



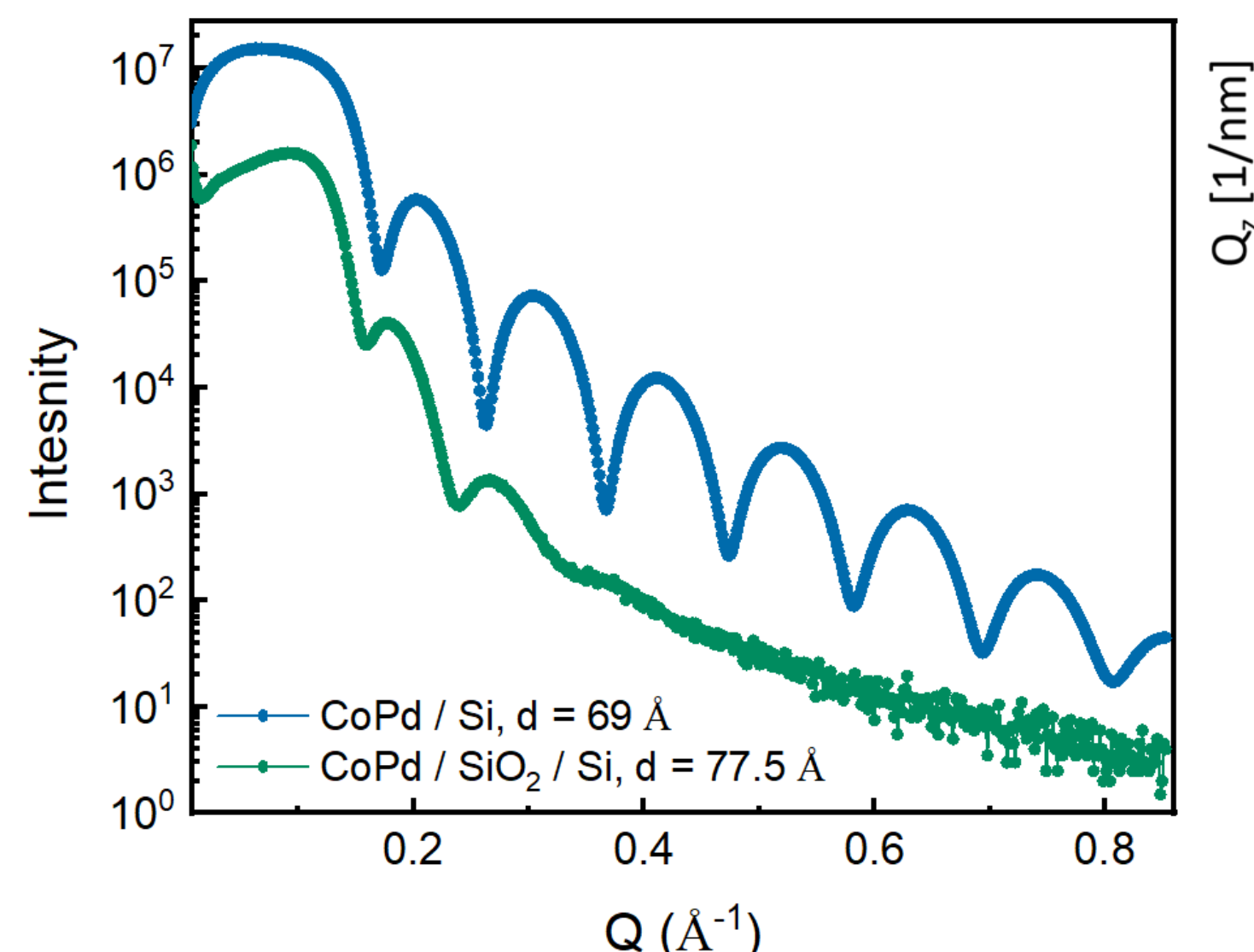
### Intensity Integration a long $Q_y$



### M-H @ SQUID



### Depth-resolved characterization by XRR



- Co/Pd @ 50 nm  $SiO_2$  NPs → Isolated magnetic nanocaps

## Acknowledgment

We thank Jochen Friedrich from PGI-7 for providing SEM

## Contact

a.qdemat@fz-juelich.de

Member of the Helmholtz Association