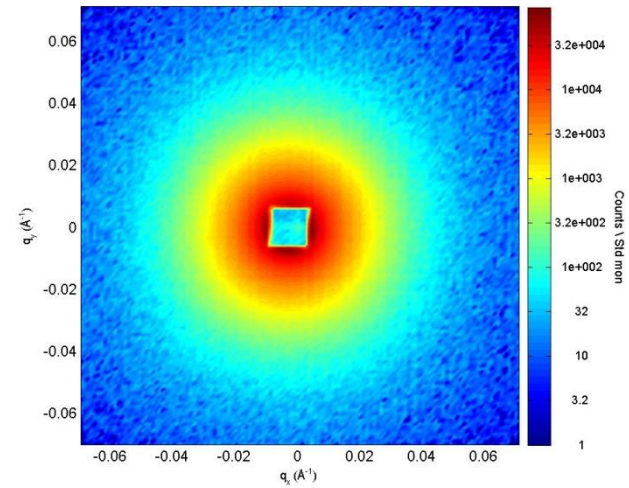
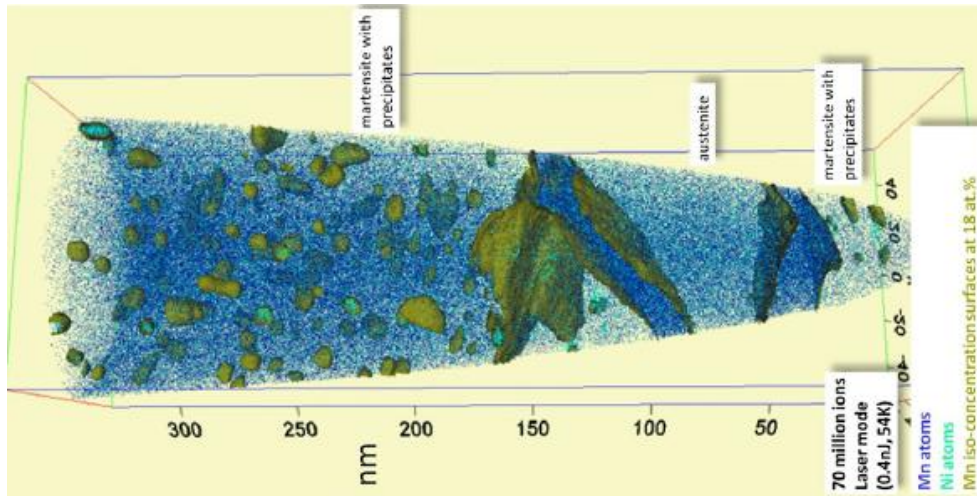


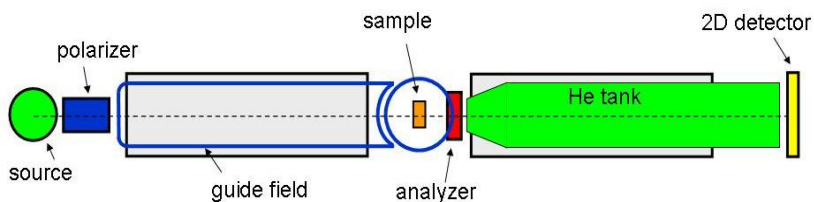
Materials research with Larmor



Jilt Sietsma

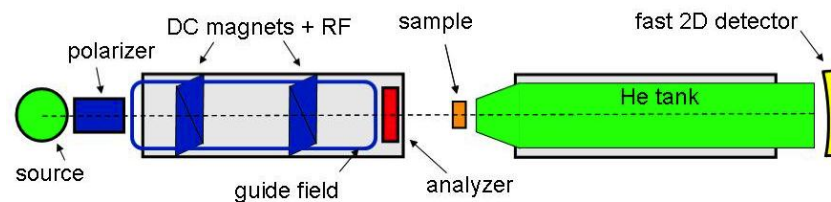
LARMOR @ ISIS

structure

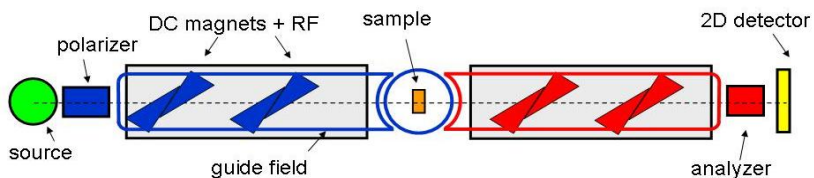


Small Angle Neutron Scattering (SANS)
with option for polarised neutrons

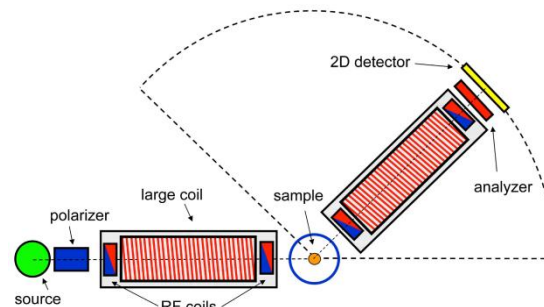
dynamics



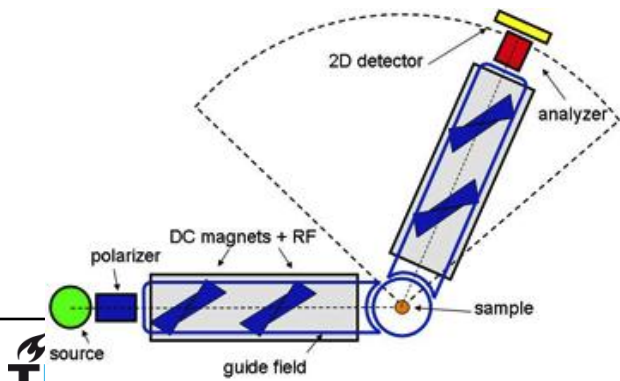
Modulated Intensity Small Angle Neutron Scattering (MISANS)



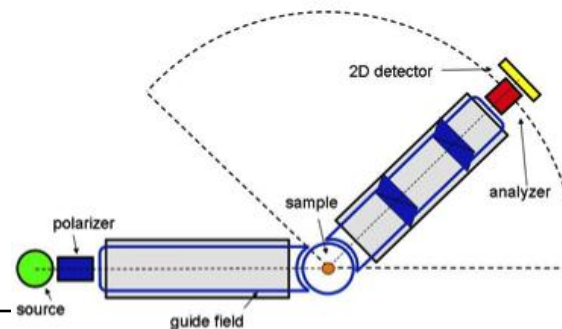
Spin Echo Small Angle Neutron Scattering (SESANS)



Neutron Resonance Spin Echo (NRSE)

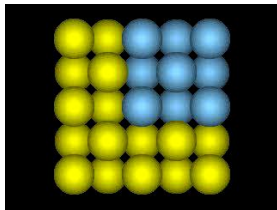
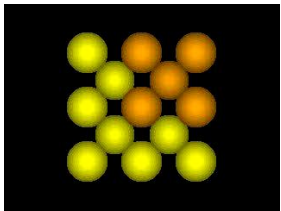
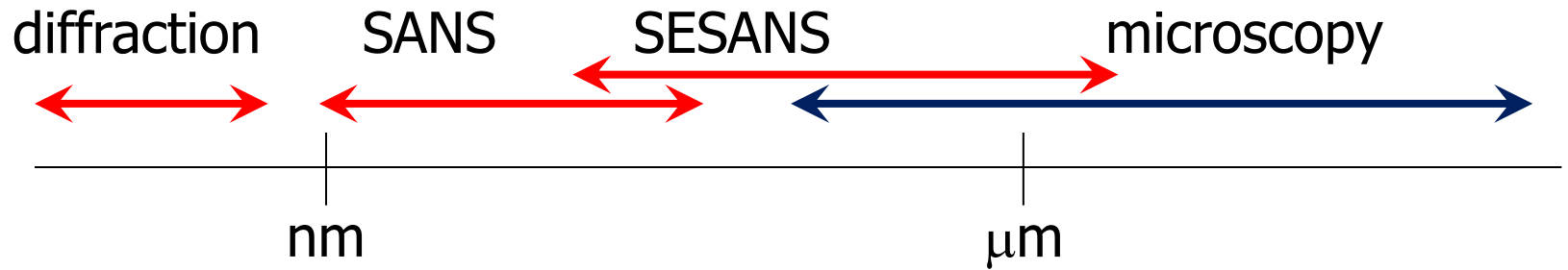


Larmor diffraction

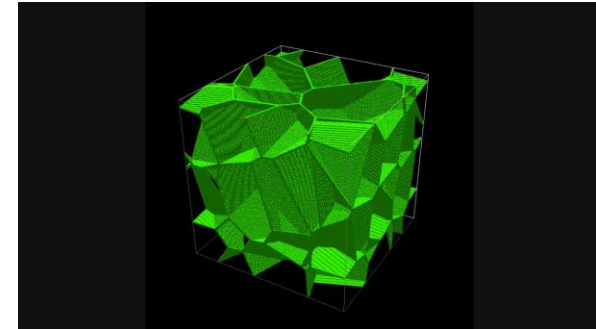
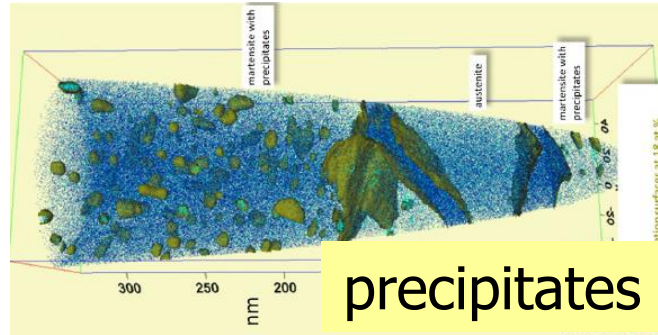


Time-of-Flight Larmor labeling (TOFLAR)

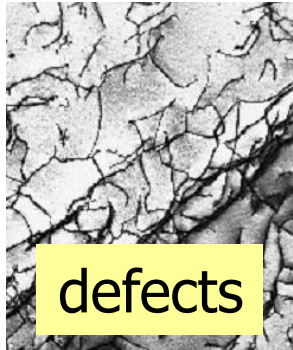
Structural features at different length scales



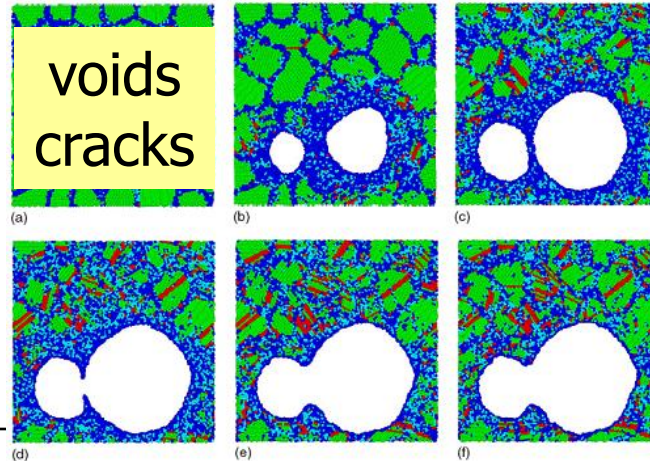
phases



microstructure



defects



Structural analysis

Larmor diffraction

Ångström-range, 10^{-6} resolution

Polarisation SANS:

1 – 100 nm

SESANS:

30 nm – 30 μm

Examples of application fields

- Energy-storage materials
- Self-healing materials
- Structural materials
- Membrane materials
- Composite materials

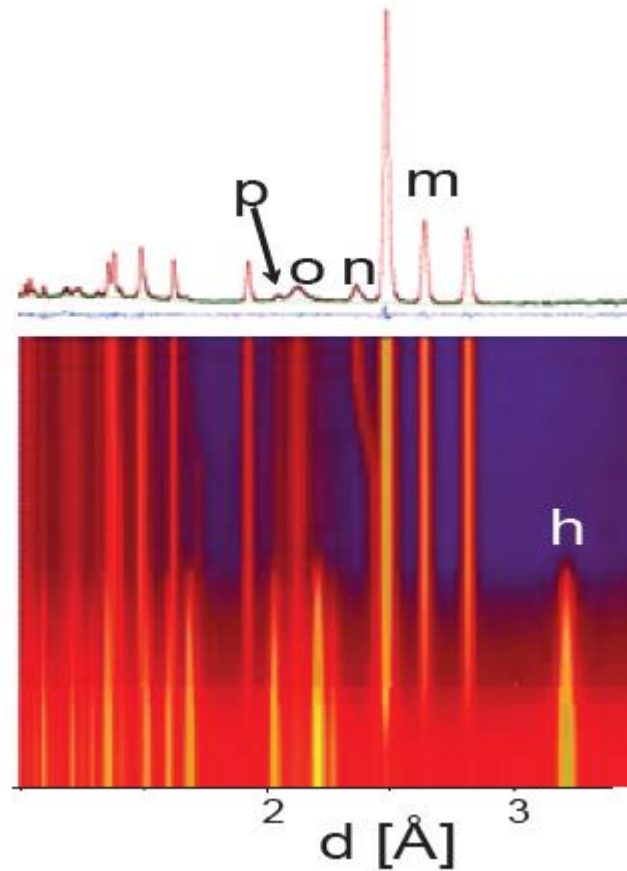
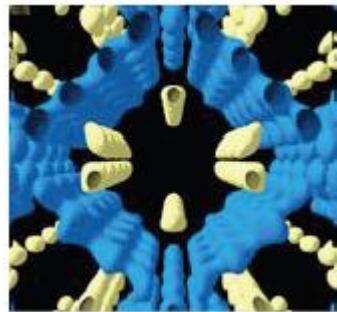
Mechanisms and structural features:

- Phase transformations
- Second-phase distribution (e.g. precipitates)
- Defect formation, crack and void distributions and growth
- Internal strain development
- Dislocation structures

Measurements

- Sample environment: high temperature ($>1000^{\circ}\text{C}$), mechanical loading
- Bulk measurements
- Time-dependent development (minutes)
- Element contrast (light elements)
- Ångström- to micrometre-scale observations

Hydrogen storage in a porous Metal-Organic Framework

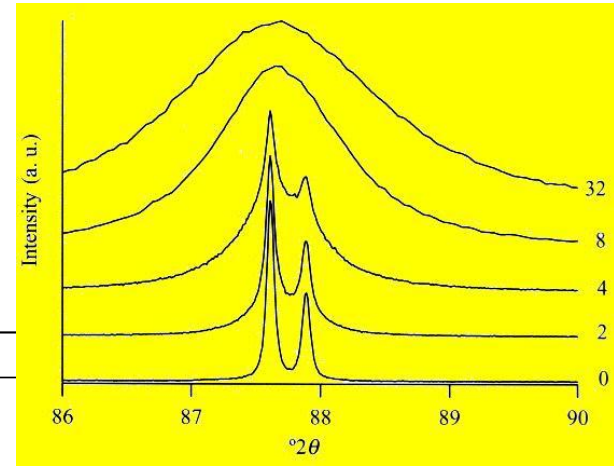
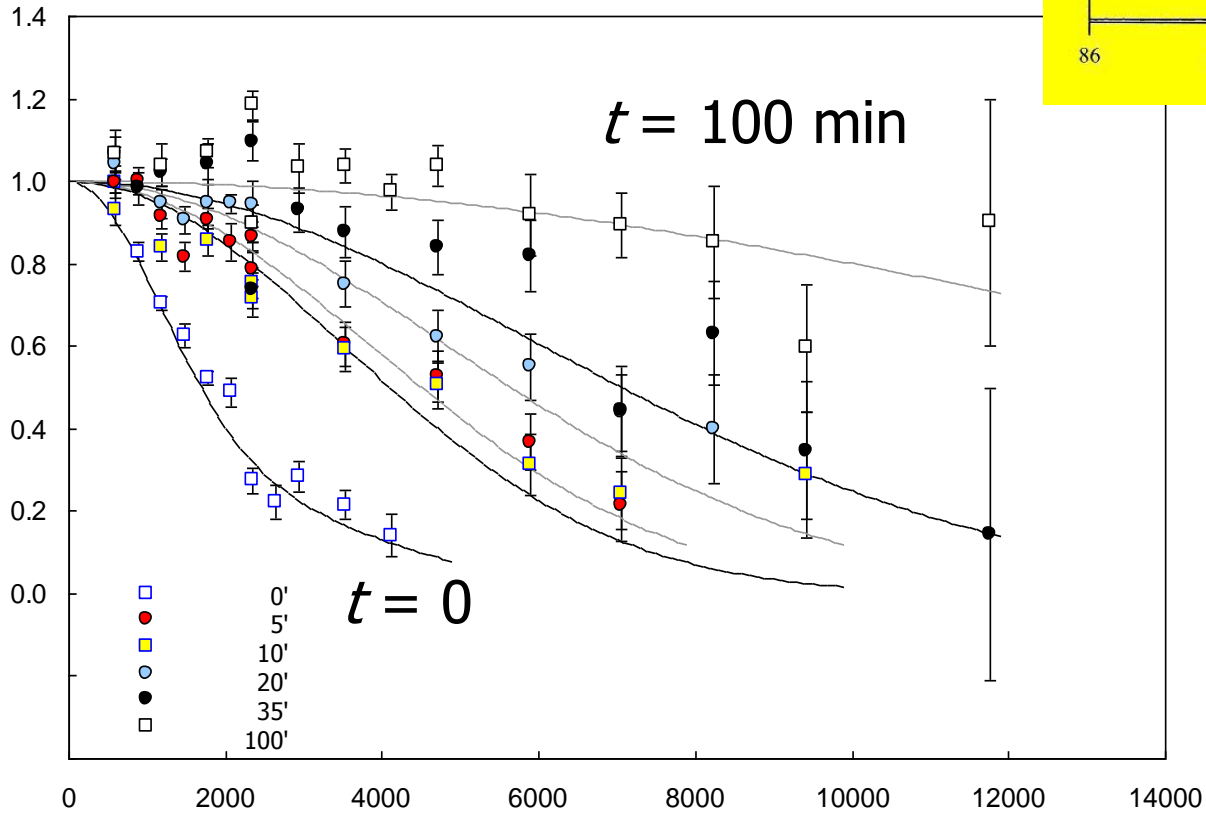


neutron
diffraction

Fokko Mulder et al.

Diffraction on dislocation densities

$A(\varphi)$

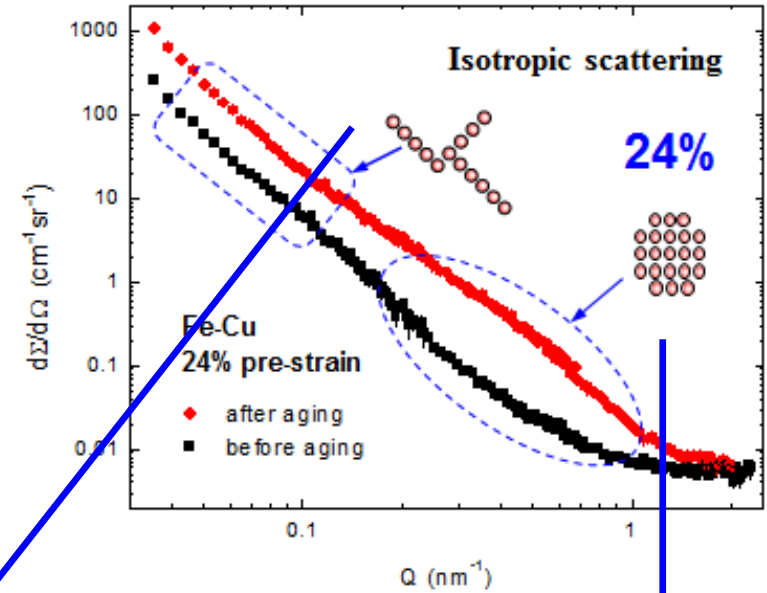
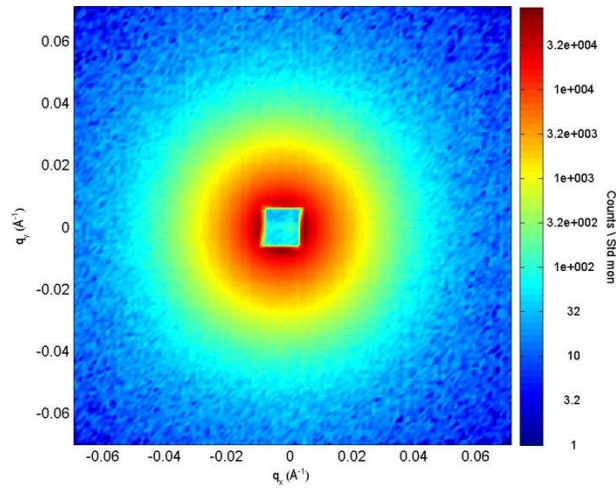


XRD

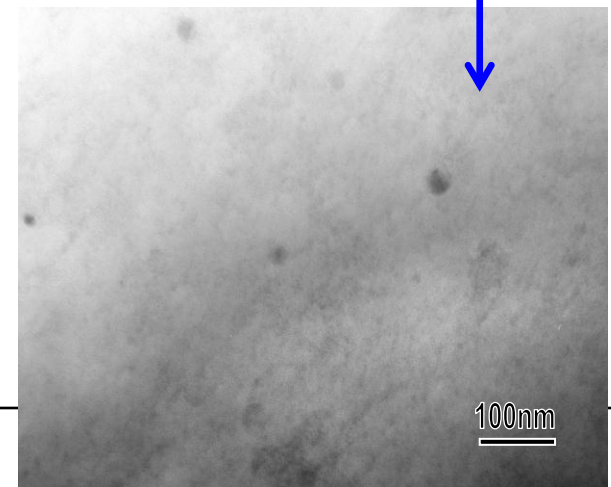
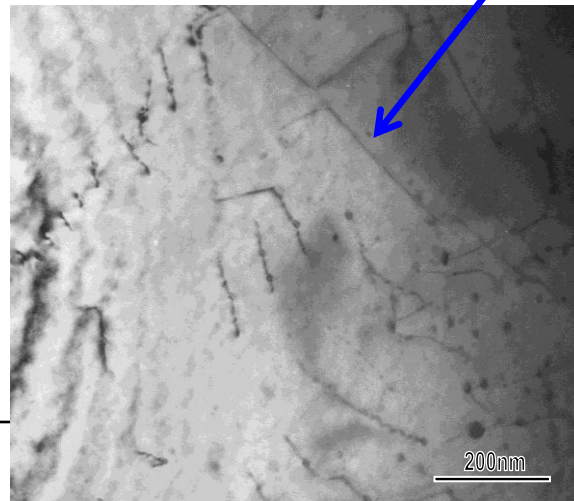
Larmor
diffraction

Self-healing mechanism in Fe-Cu: Cu-precipitation

SANS
at ILL



Electron
Microscopy



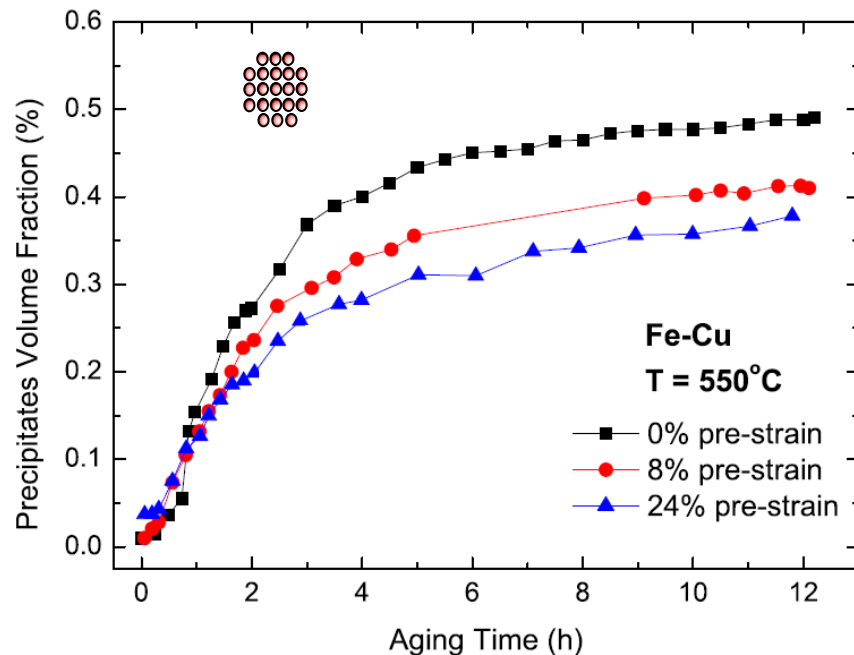
Niels van Dijk et al.

Time-resolved SANS measurements Fe-Cu at 550°C

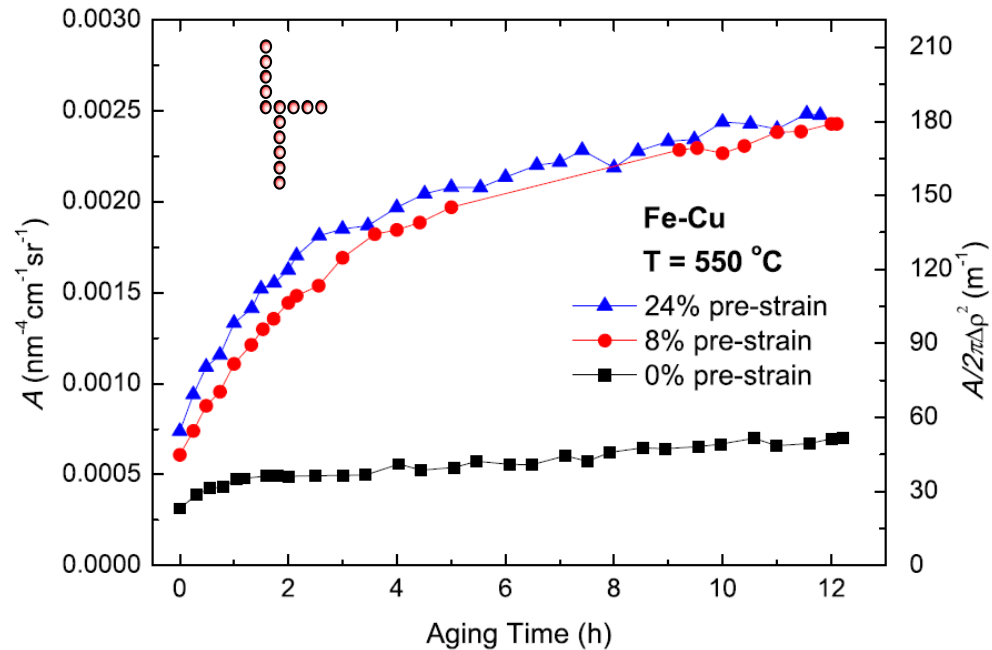
Contributions: 1. spherical Cu particles 

2. network of Cu along dislocations or interfaces 

fraction spherical precipitates

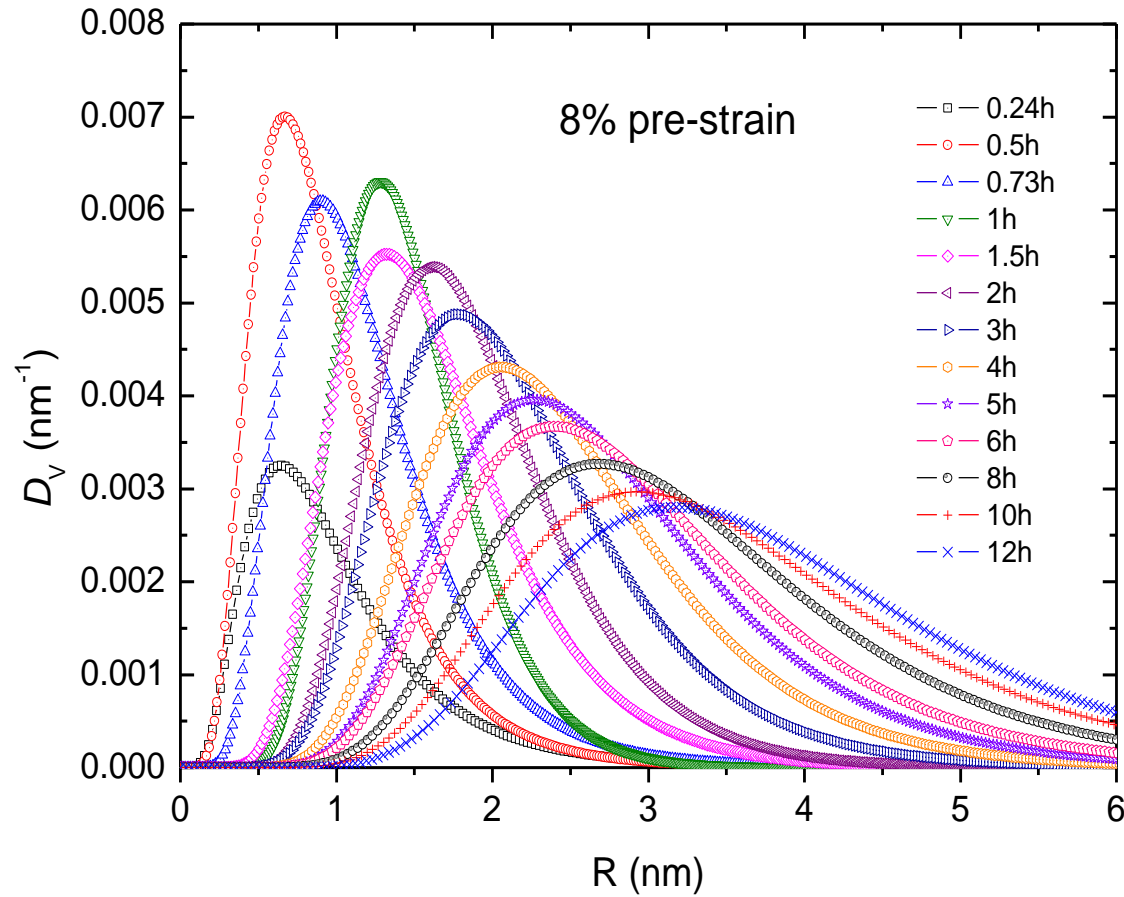


segregation dislocations/interfaces



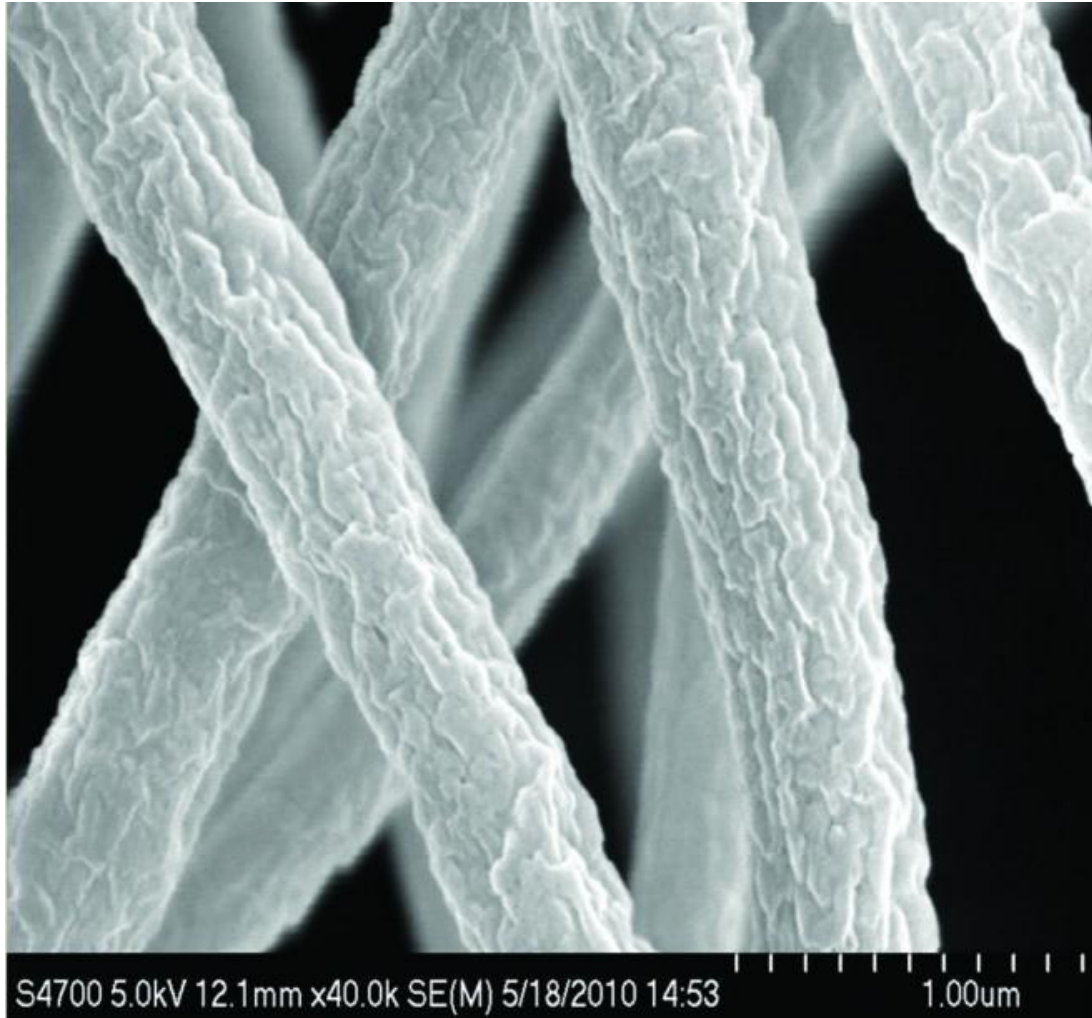
Pre-strain leads to a strong Cu precipitation at dislocations/interfaces

Time-dependent size distribution of spherical Cu-precipitates

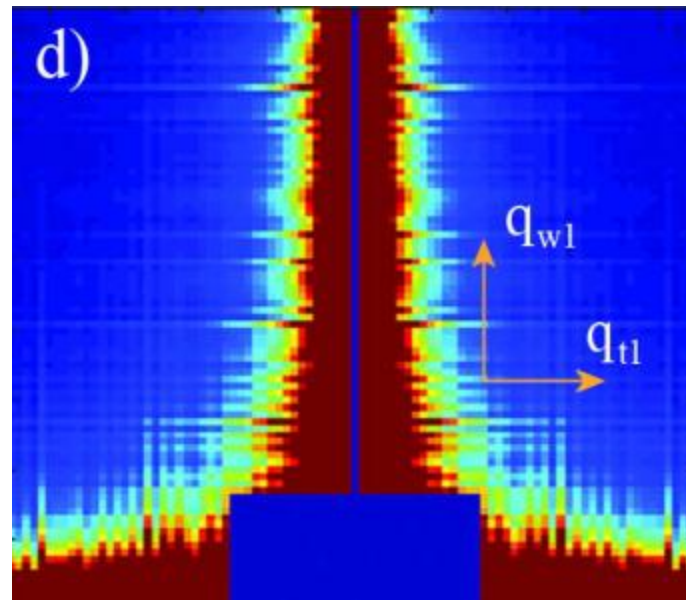


Niels van Dijk et al.

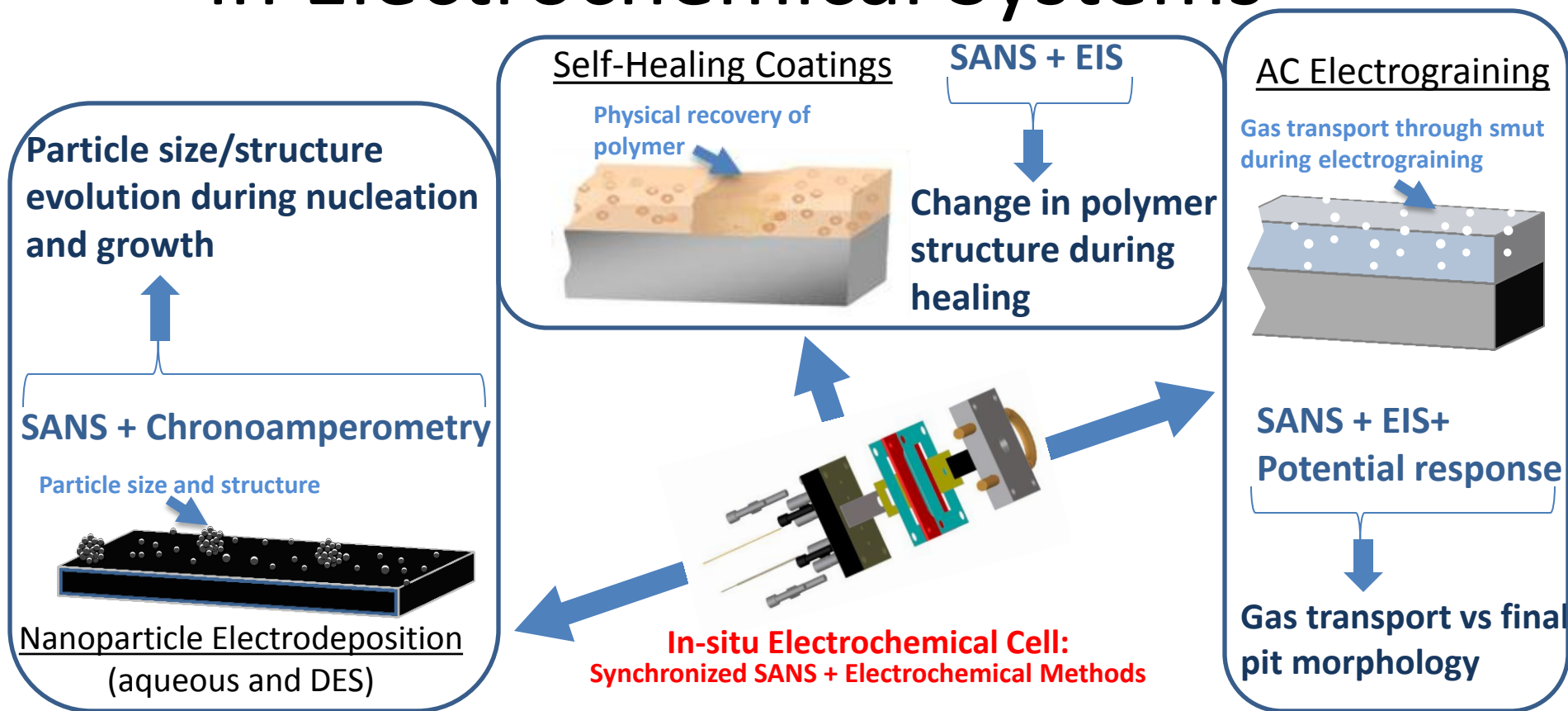
Composite materials: fibres



Small-Angle Scattering from ordered dislocation structures

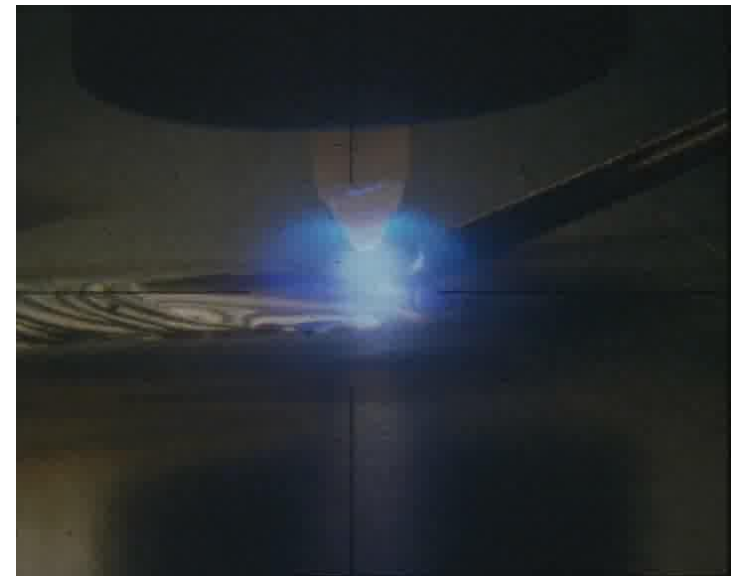


In-situ Surface Characterization in Electrochemical Systems

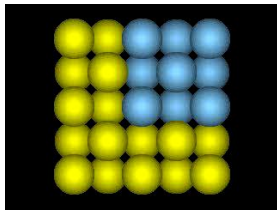
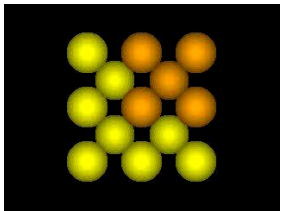
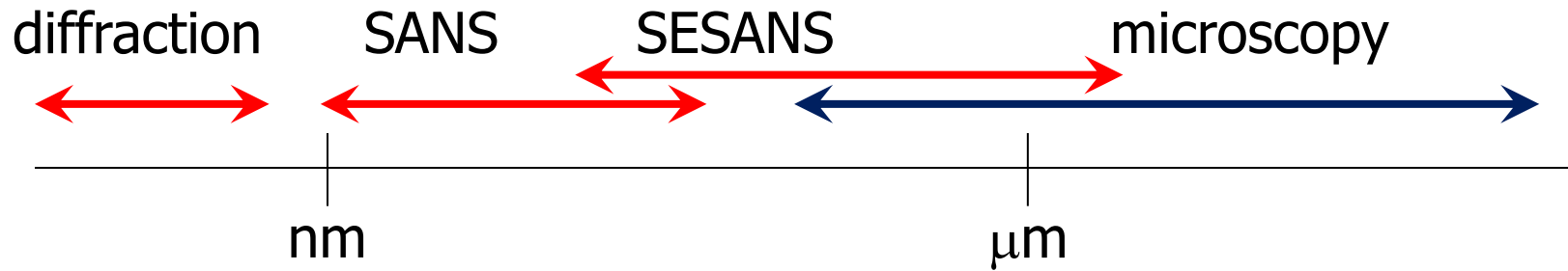


Welding

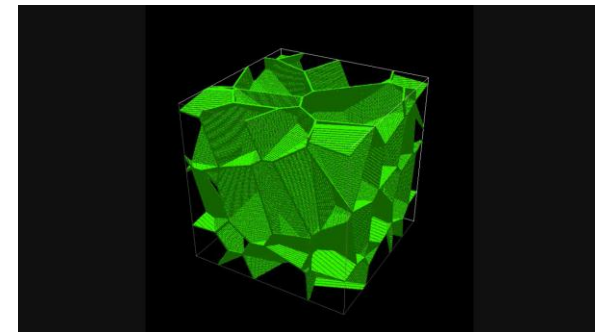
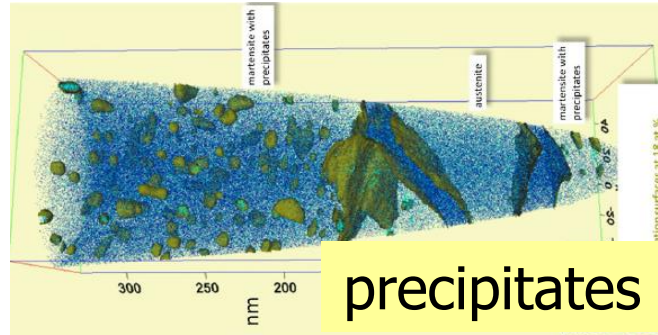
- Stress development in large cross-sections
- Hydrogen
- Heat-Affected Zone



Structural features at different length scales



phases



microstructure

