

# Try neutrons and obtain new information

Metallurgy • Powder metallurgy • 3D-printing • Composites

### NON-DESTRUCTIVE STRESS MAPPING

in large engineering pieces:

- From near-surface to bulk, up to 6 cm in steel or 30 cm in aluminium for instance.
- Effect of surface and/or hardening treatments actually measurable.

### DIFFRACTION

- Kinetics of alloy synthesis.
- Spatially resolved phase analysis, texture determination.
- Structural evolutions and phase transformations under various environmental conditions.

### IMAGING

- Radiography and tomography of complex and heavy pieces.
- Water and polymers easily visible within metallic structures.
- Spatial resolution from 6  $\mu\text{m}$ .
- Field of up to 20 cm x 20 cm.

### SMALL ANGLE SCATTERING (SANS)

- Study of corrosion, porosities, precipitates, inclusions.
- Probe the nanostructures of precipitates and nucleation in metals and alloys.
- Obtain growth rate information for nanoparticulates using *in-situ* methods.
- Structural characterisation in the 1 nm to 1  $\mu\text{m}$  range within a few  $\text{mm}^3$  with neutron scattering.
- Use unique contrast matching methods to focus on specific components of material.

#### Metal work

casting, forging, rolling, welding,  
brazing, thermal treatments, surface  
treatments

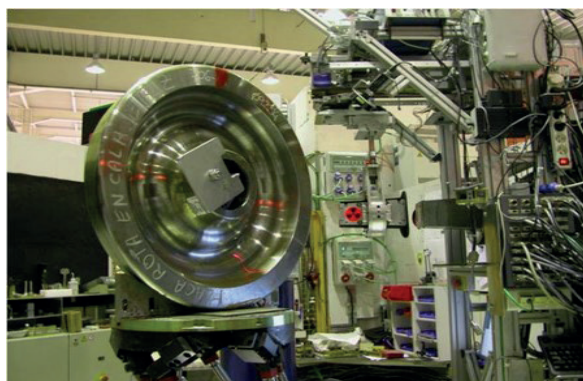


Fig. 1 A wheel of a train under investigation for non-destructive residual stress during a legal expertise. Credit: Pirling/ILL

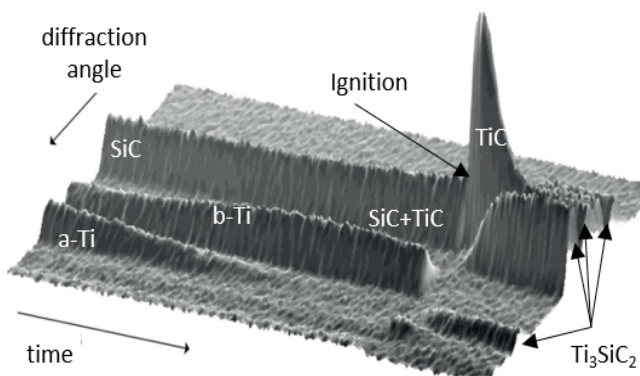


Fig.2 Alloy formation during synthesis process. Neutron Powder diffraction. Riley et al. 2006

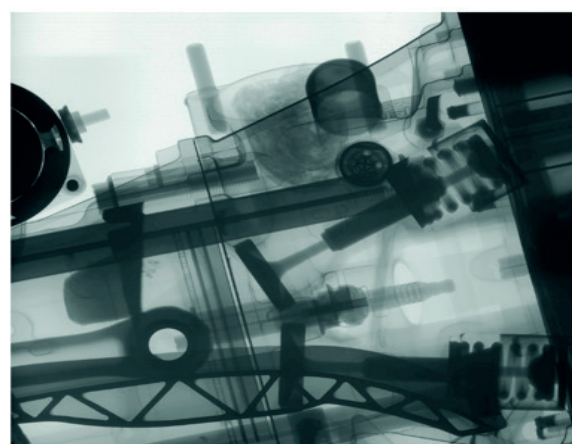


Fig. 3 Radiography of a motorcycle engine, Maier-Leibnitz Zentrum

# NEUTRONS FOR INDUSTRY

industry@sine2020.eu

SINE2020 Industry Consultancy is now open for requests

## Proof-of-concept experimental beam time is being offered to Industry!

### RAPID ACCESS

Fast-stream processing for industrial applications, optimising result lead times.

### CONFIDENTIALITY

Activity covered by non-disclosure agreements. Only company name and measurement type to be published.

### FLEXIBLE SERVICES

In many cases industrial processes and conditions can be re-created in the test laboratory. Final data analysis and reporting are provided.

# SINE 2020

### EXPERT CONSULTANCY

Industrial R&D professionals in collaboration with experienced specialists from European neutron centres.

### PARTNERS

Czech Republic  
France  
Germany  
Hungary  
Netherlands  
United Kingdom



SINE2020 receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 654000.

