

Trends and User needs – WG materials

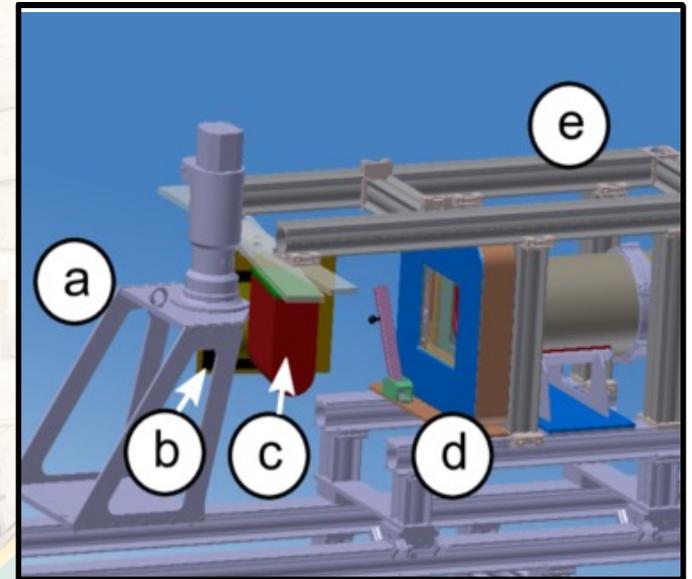
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- ICNS, Copenhagen, Denmark, July 2025

needs

Discussed:

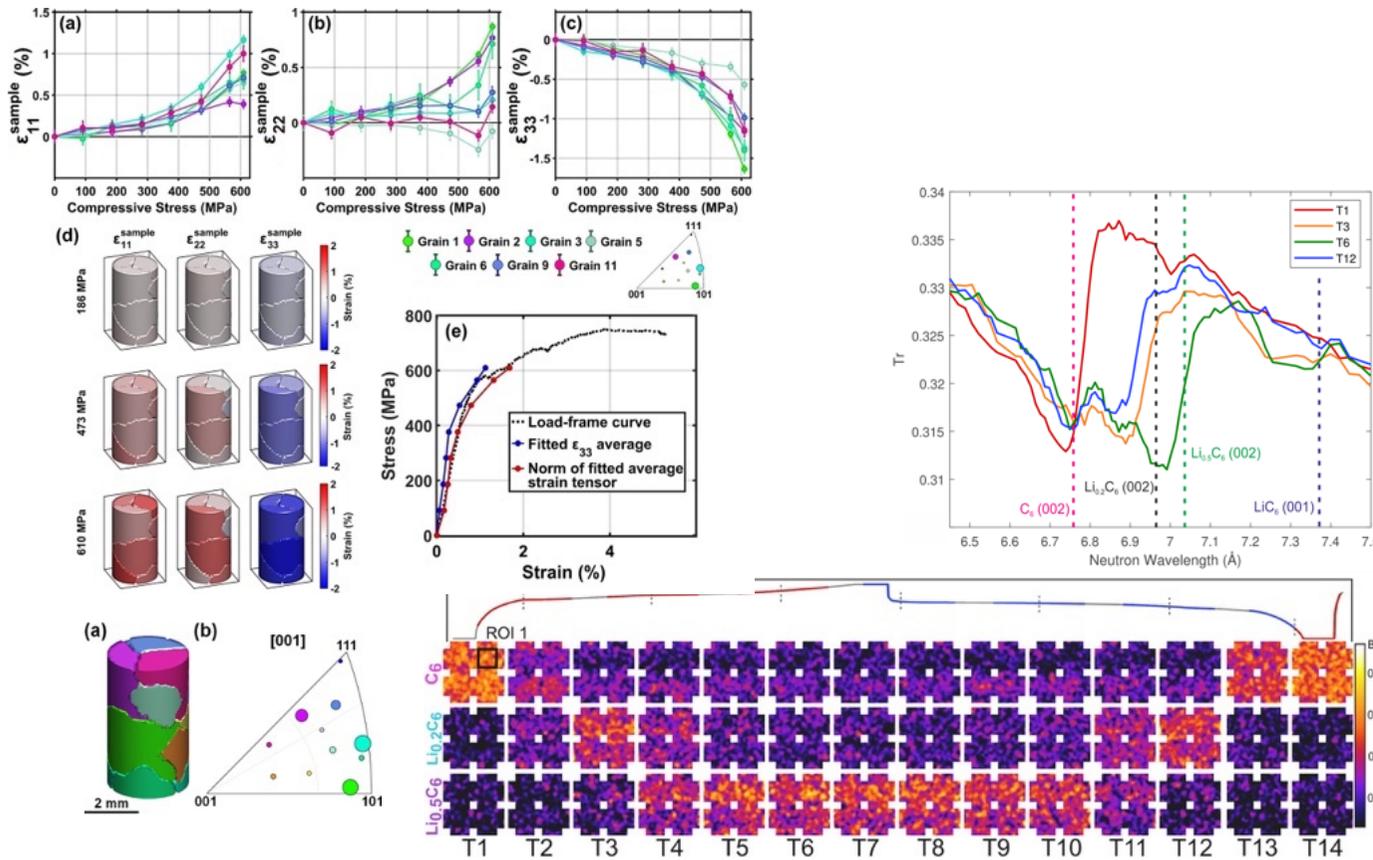
- Applied research requires Resources
- Complex operando Experiments
- Complex combinations of Methods
- Complex set-up and Implementation
- Safety aspects
- Industry needs
- Expert staff; keep educated Staff, at least in community, Create database of available Experts and open positions
- Mobility vs sustainable careers

operando **multimodal**



SUPPORT?

Overwhelming complexity



Discussed:

- Not only highly non standard sample environments but also complex set-ups tailored to needs of specific experiment;
- Data analyses strategies highlyly specific to individual meausrement
- Resource intense experiments from set-up to operation to data handling and analyses

Experimental support
Techn. support

Overwhelming data handling

SUPPORT?

Discussed:

- experiments, in particular in imaging produce particularly large data sets which drive data infrastructure requirements beyond the needs of other techniques and instruments and thus need specific attention and support in order to serve users beyond demonstration experiments



Volume



Value



BIG DATA



Veracity



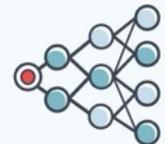
Visualization



Variety



Velocity



Virality

Overwhelming data analyses - AI??

Discussed:

- Corresponding to complexity, data size and highly variable data structures and analyses needs the availability of dedicated software tools and analyses pipelines are a challenge and typically also resource intense;
- Community willing to collaborate and share software and developments, but also limited by resources and frameworks → a separate workshop on this topic took place at ICNS
- AI tools are promising but face similar challenges of resources and broad applicability

Development -SUPPORT?

Model 2: Residual Attention Convolutional Network (RAC-Net)

Residual blocks for better learning and an attention mechanism for refined prediction focus

