

Dynamics of lithium-distribution in 18650-type lithium-ion batteries during electrochemical cycling

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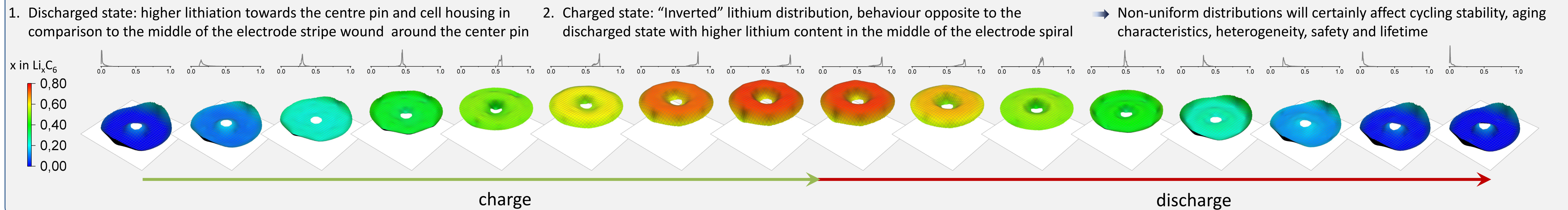
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Aim

1. Non-destructive studies of lithium distribution in the interior of a cylinder-type Li-ion cell
2. Monitoring the uniformity of the graphite lithiation in a high-power $\text{Li}_x\text{FePO}_4|\text{C}$ 18650-type lithium-ion battery vs. cell charging/discharging using spatially-resolved neutron powder diffraction
3. Probing the lithium distribution in a $\text{Li}_x\text{FePO}_4|\text{C}$ cylinder-type lithium-ion battery on μm -scale in fully charged state using X-ray diffraction

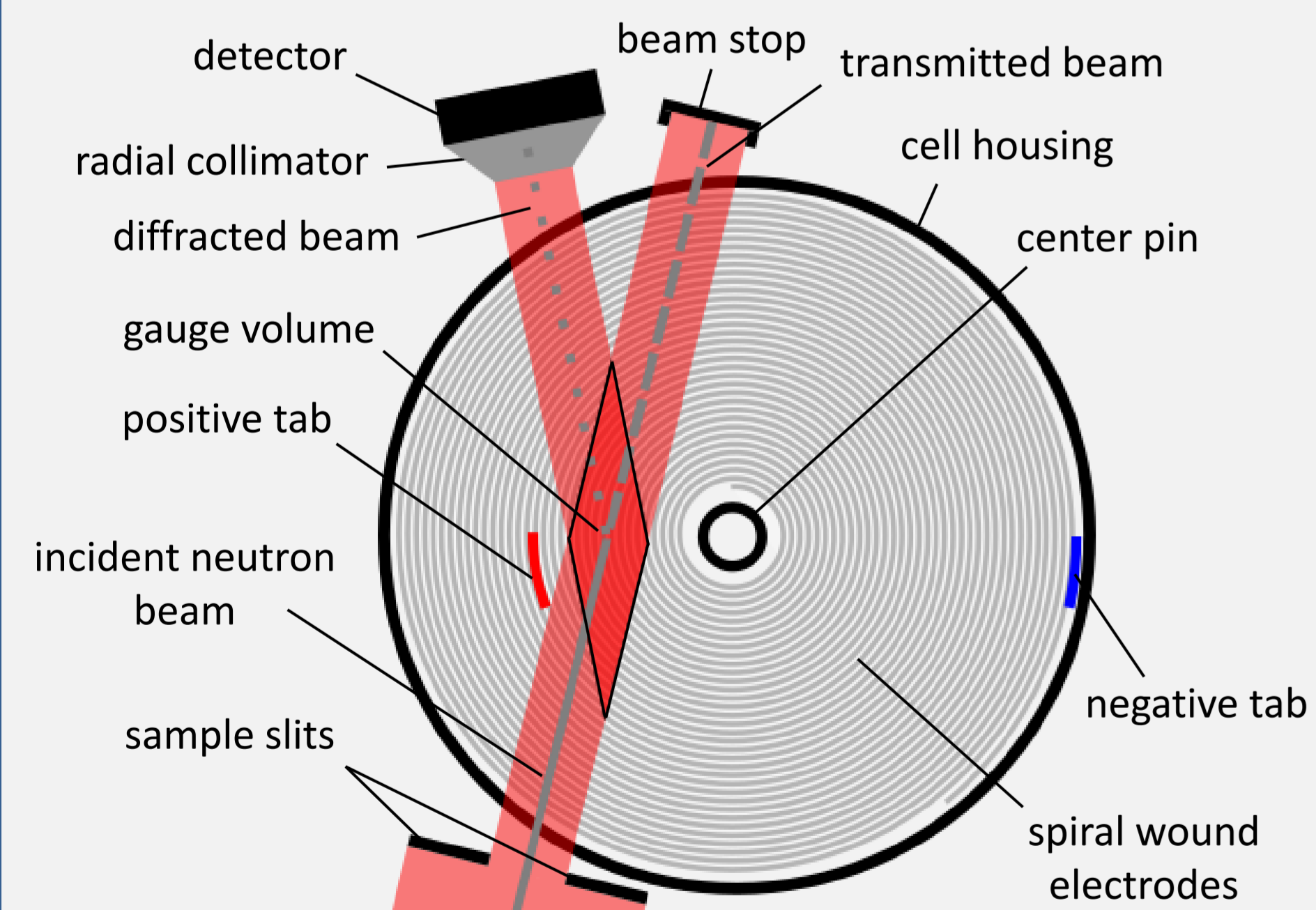
Results

Lithium distribution in the graphite anode during cell charge/discharge monitored with mm-sized spatial resolution:

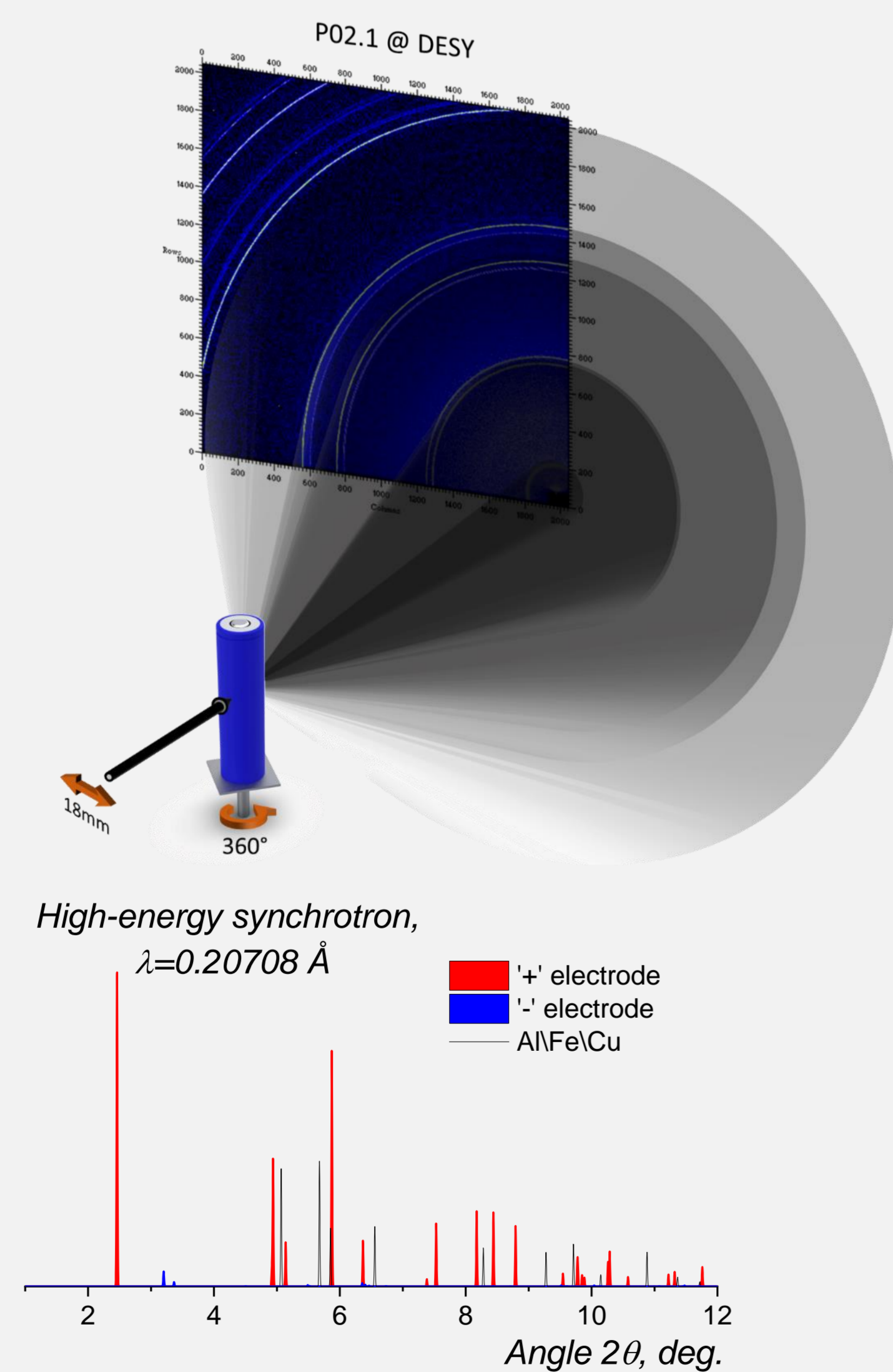


Methods

Spatially-resolved neutron powder diffraction

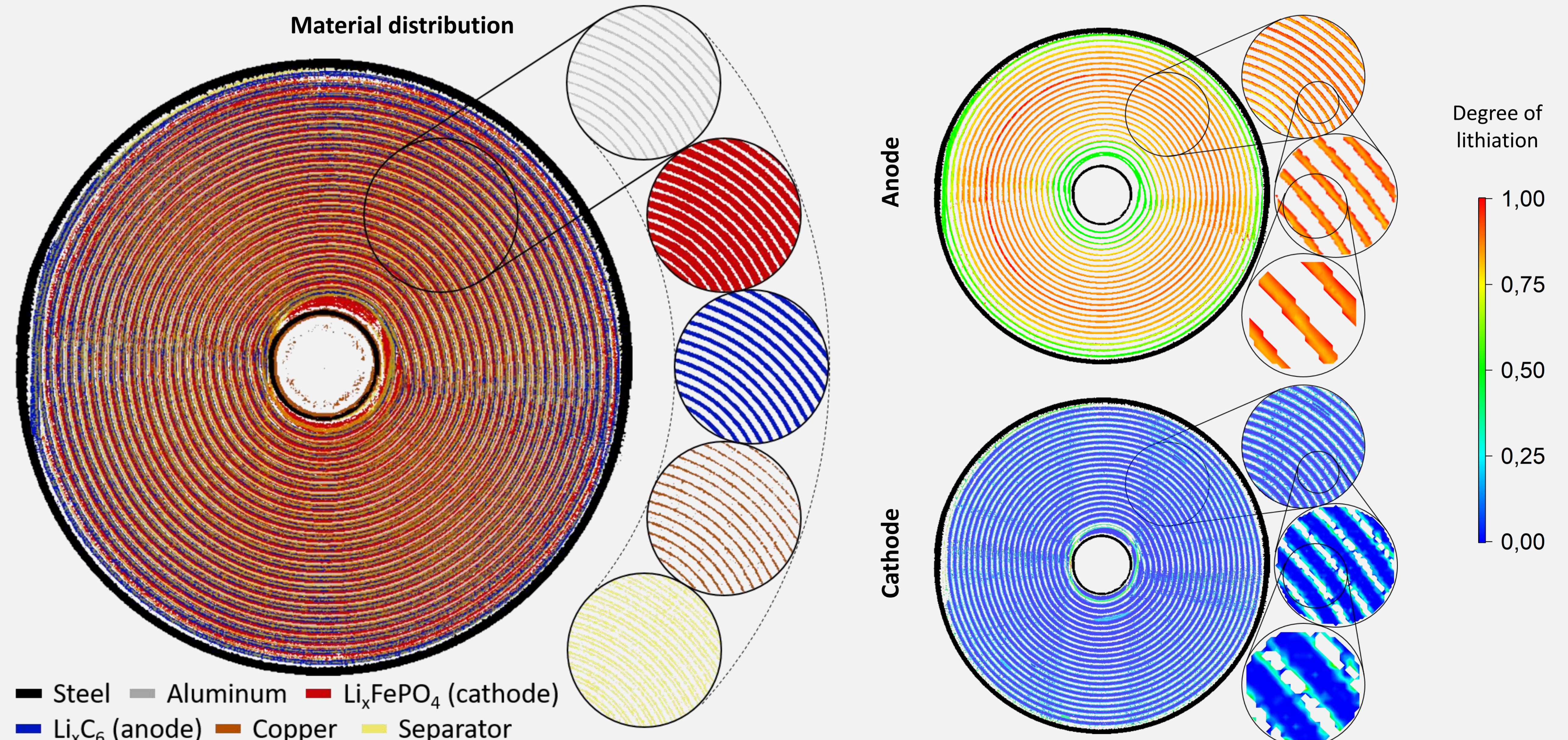


X-Ray diffraction



Lithiation of the Li_xFePO_4 cathode and the graphite anode in fully charged state on μm -scale (X-ray diffraction):

1. Lithiation of the cathode is generally more uniform along the electrode stripe
 2. Systematically higher lithium concentrations at the separator side compared to the current collector side
- The optimization of lithium gradient through the electrode thickness is crucial factor for the cell performance



Literature

Petz, D., et al., *Lithium distribution and transfer in high-power 18650-type Li-ion cells at multiple length scales*. Energy Storage Materials, 2021. 41: p. 546-553.