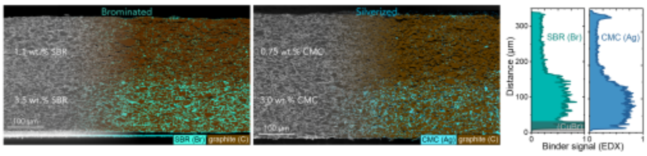
PROJECT NUMBER

23522

Advanced chemical staining platform for battery manufacturing

This technology uses selective chemical staining to map and quantify polymer binders inside lithium-ion electrodes. By labelling binders with metal ions or halogens, it enables accurate imaging using standard SEM/EDX tools for fast electrode optimization and quality control.

Applications: Li-ion battery, electrodes, graphite/ silicon anodes



Features	Benefits
Uses aqueous metal-ion solutions (e.g. Ag^+) to selectively bind and label aqueous binders such as CMC or PAA in graphite and Si-based electrodes	Enables >80-98% accurate mapping of low-concentration binders (<5 wt.%) using widely available SEM/EDX techniques without altering binder distribution
Applies controlled halogen vapour exposure (e.g. Br_2) to stain alkali-salt binders within electrodes	Provides solvent-free, rapid binder labelling even in complex microstructures with nanopores
Exploits differential stability of halogen bonding under electron irradiation to distinguish unsaturated from carboxylated binders	Allows selective and independent quantification of mixed binder systems (e.g. SBR-CMC) using temporal EDX analysis
Enables rapid binder-informed optimisation of electrode manufacturing	Demonstrated 14% and 40% reduction of electrode electronic and ionic resistances by binder-informed optimisation of electrode manufacturing

Features	Benefits
Enables quantification of active particle surface coverage by nanoscopic binder layers and agglomerates (10-150 nm thick)	Allows linking binder surface coverage to electrode manufacturing conditions (e.g. during calendering) and cell degradation processes

Patented and Available for

- Co-development
- Consulting
- Licensing

To find out more, contact enquiries@innovation.ox.ac.uk and quote the project number.