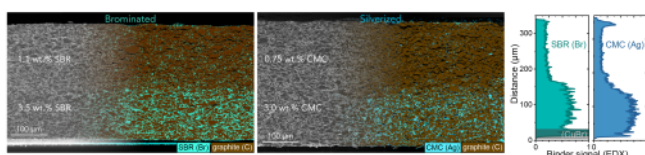


# Advanced chemical staining platform for battery manufacturing

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. $\text{Ag}^+$ ) 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. $\text{Br}_2$ ) 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 calendaring) and cell degradation processes |

## Patented and Available for

- Co-development
- Consulting
- Licensing

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To find out more, contact [enquiries@innovation.ox.ac.uk](mailto:enquiries@innovation.ox.ac.uk) and quote the project number.

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