

Hollow multi-layered MOx spheres as host for enhanced confinement of polysulphides in lithium Sulfur batteries

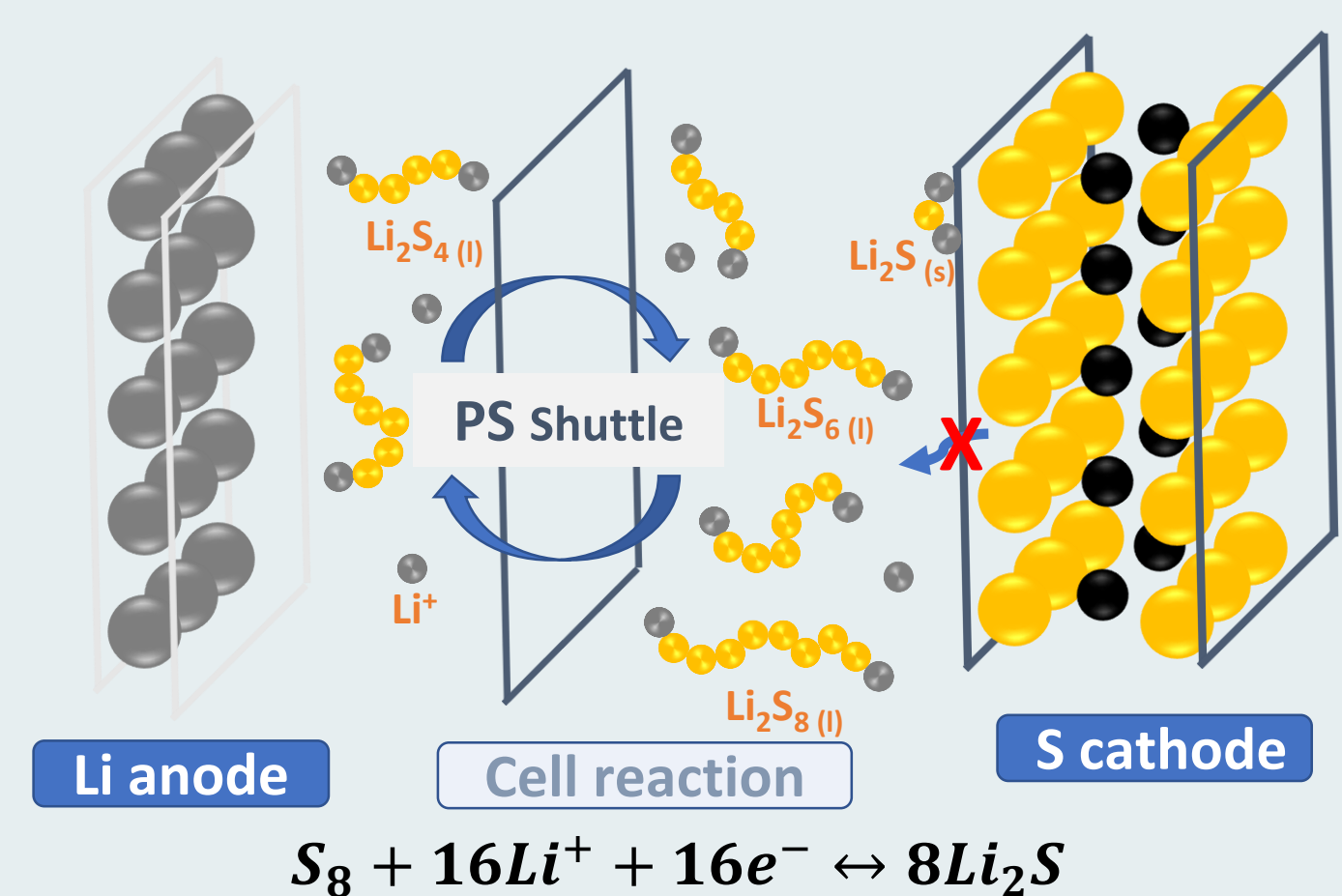
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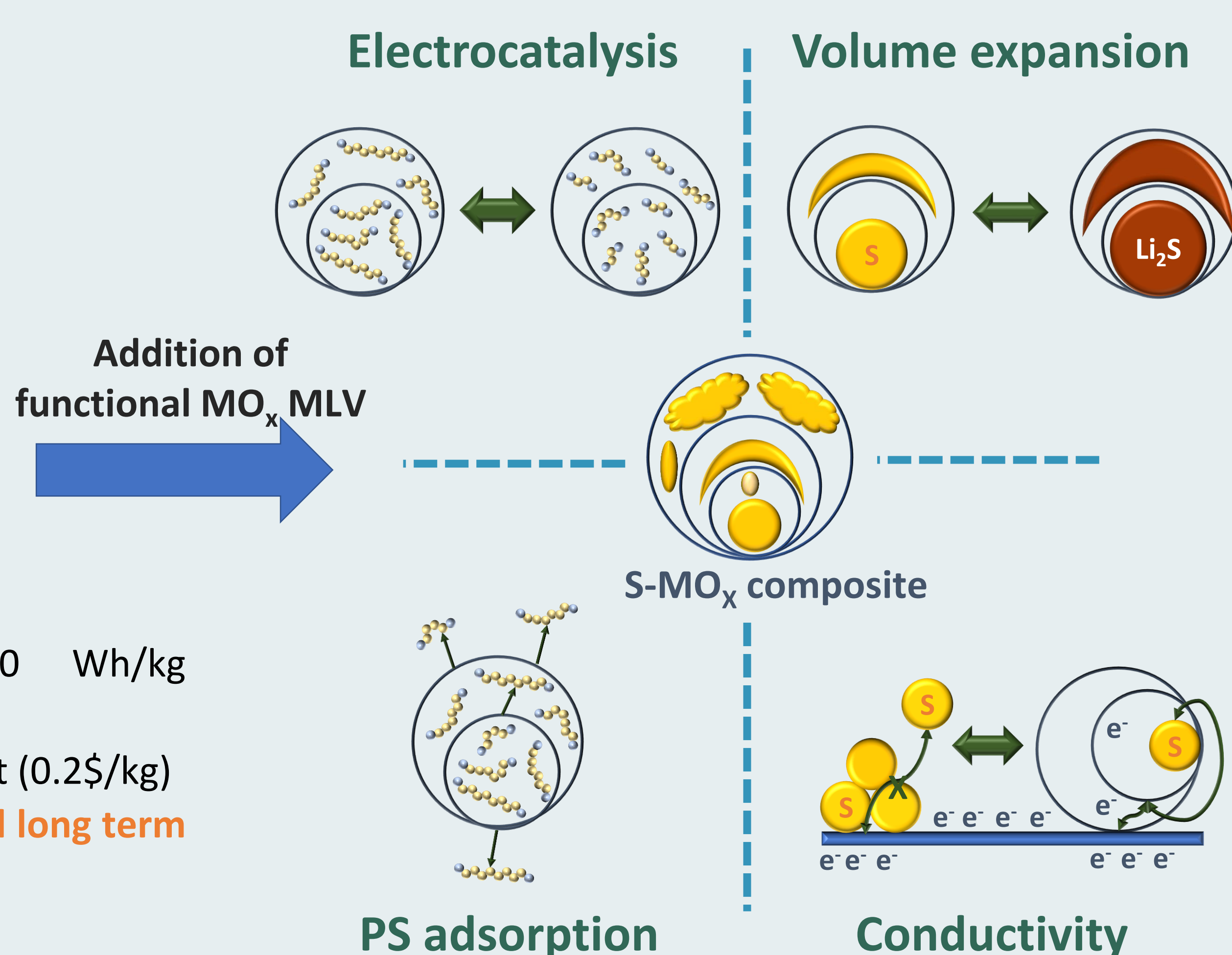
Abstract

In this research, hollow Multi-layered nanospheres were synthesized in a controlled fashion starting from a sacrificial hard template. Subsequently, the structure-performance relationship was evaluated.

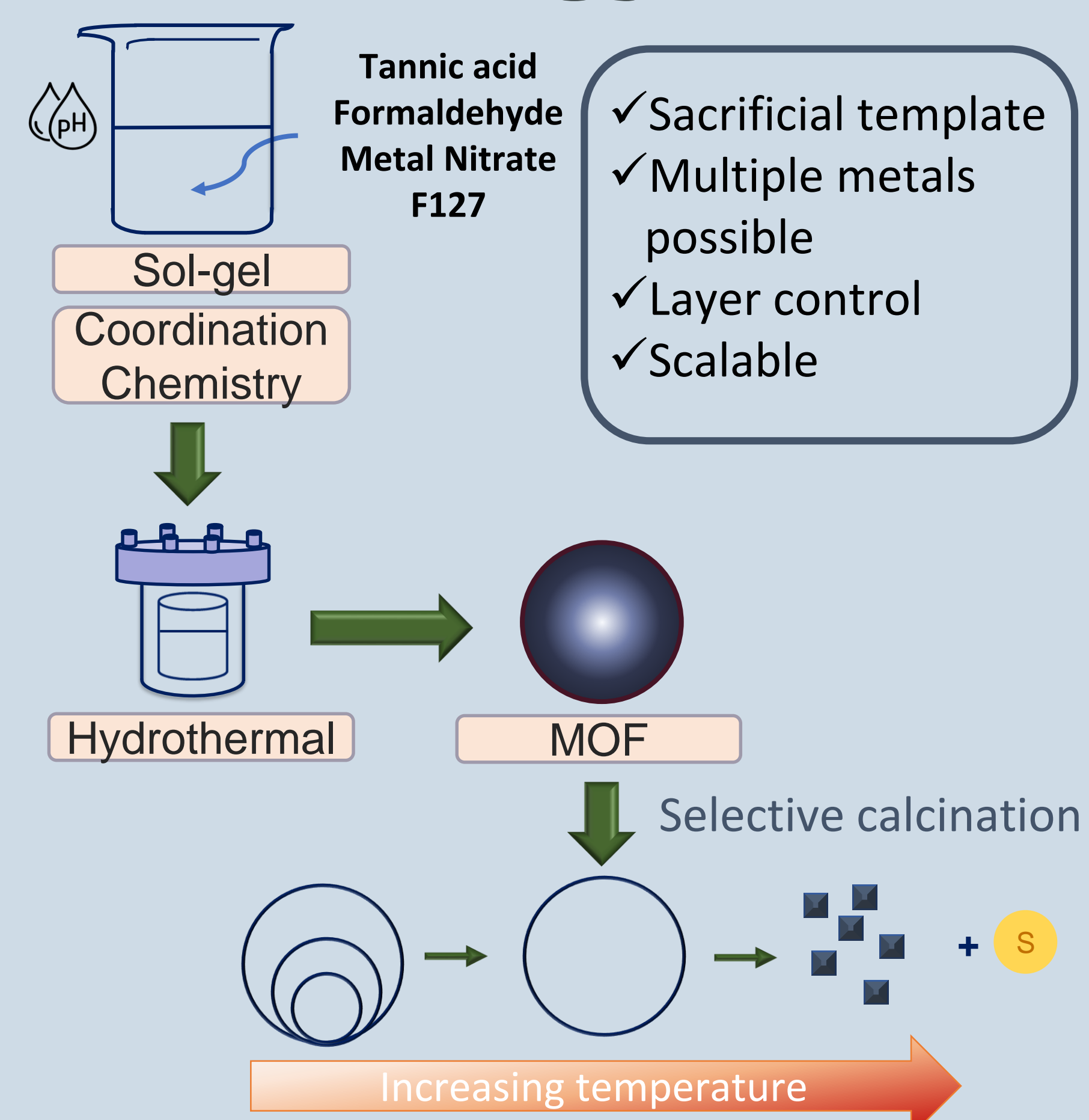
Introduction



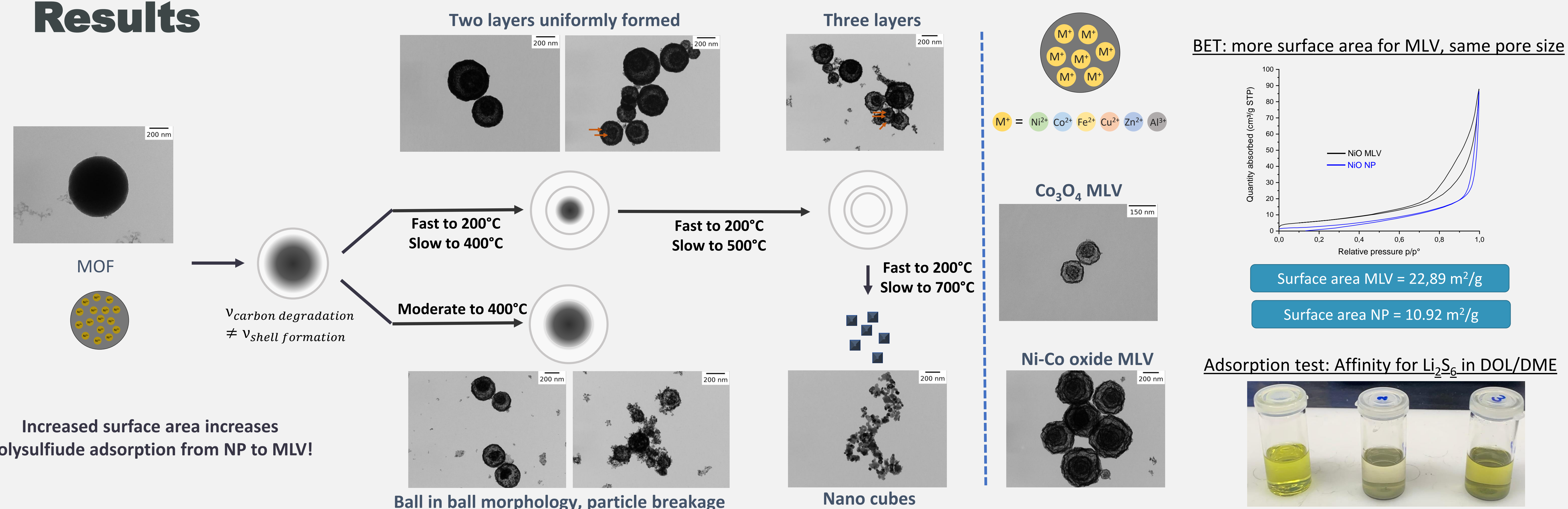
- Higher **specific energies** (2600 Wh/kg theoretical or 500 Wh/kg practical)
- Sulfur is **abundant** and thus low cost (0.2\$/kg)
- Technological challenges: **Safety and long term stability (Polysulfide shuttle)**



Methodology



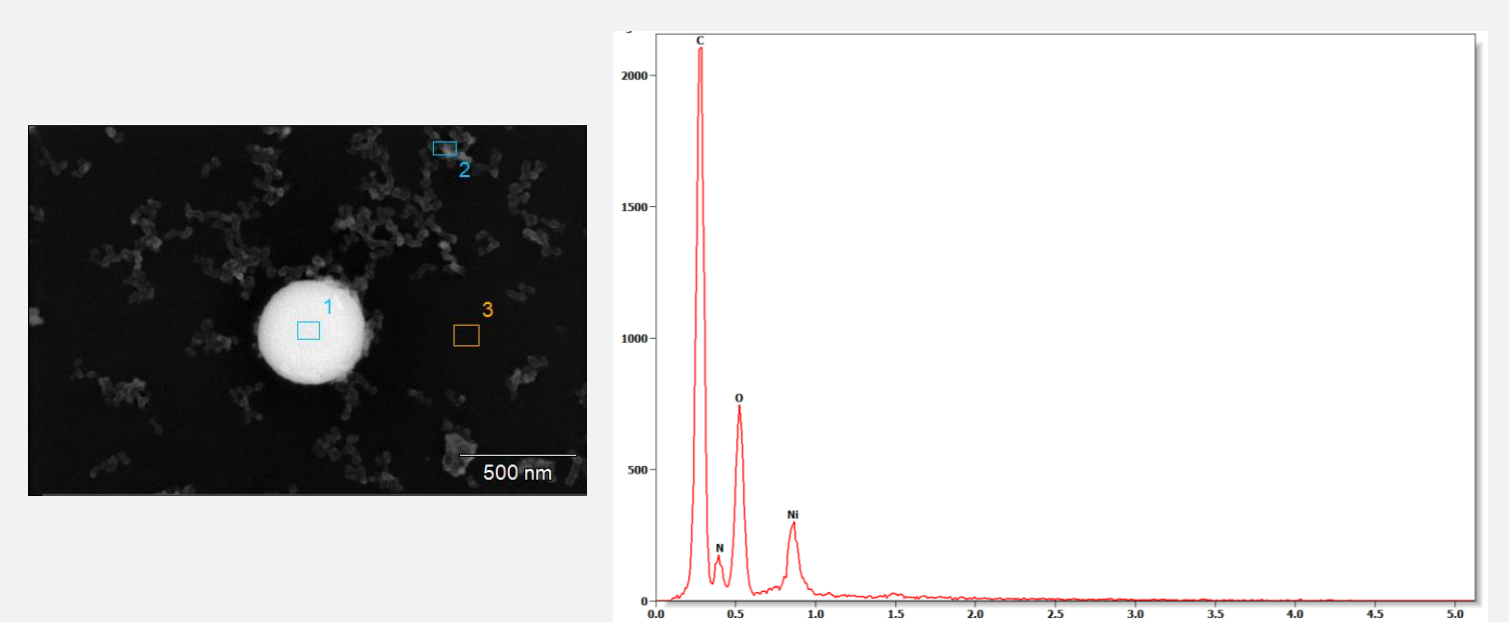
Results



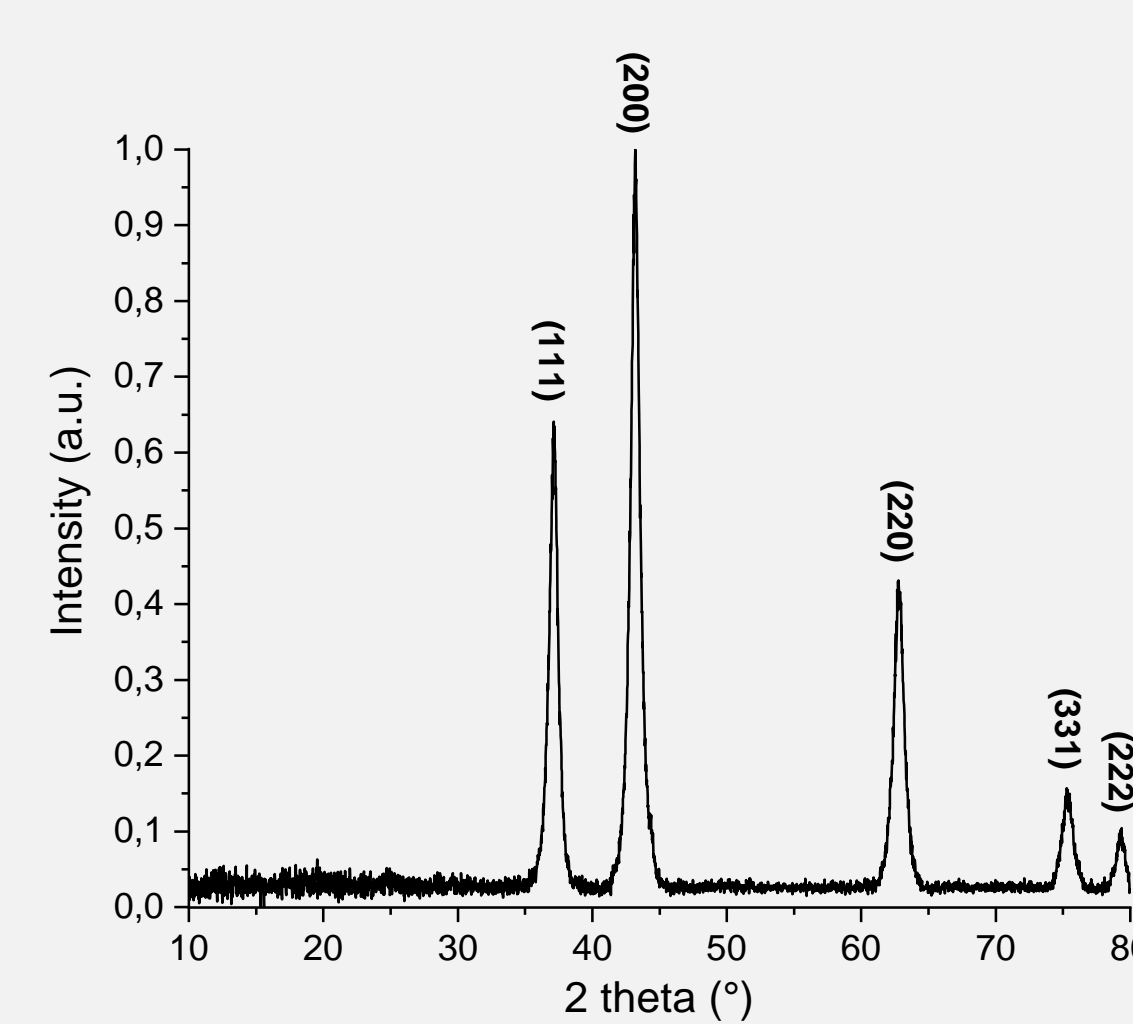
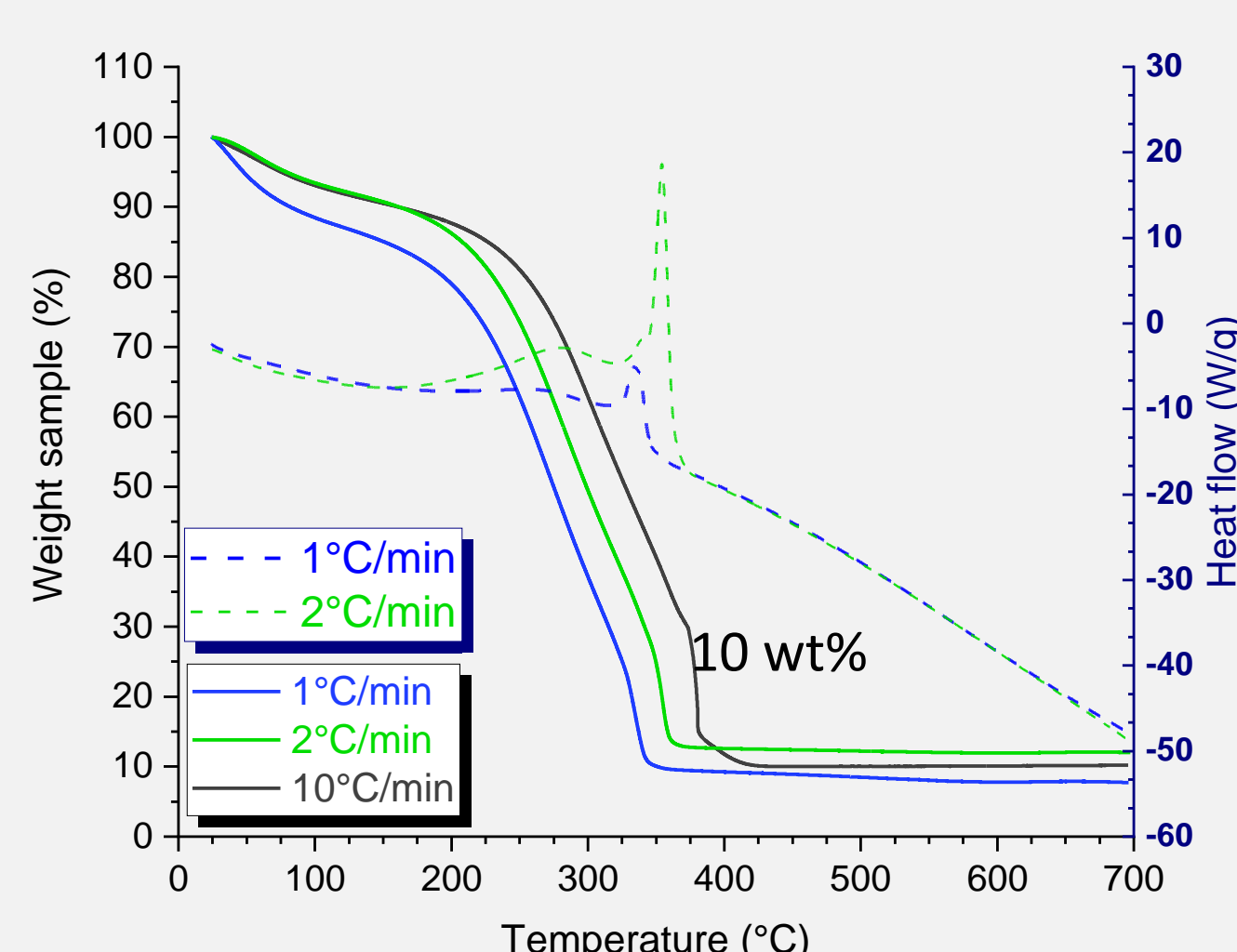
SEM-EDX confirms the Metal-organic framework

TGA-DSC: sudden mass drop at higher heating rates

XRD: formation of cubic NiO phase FM-3M



N signal present from Nitrate precursor!



- ✓ Testing of potential materials
- ✓ Increased surface area: more adsorption
- ✓ Comparison between materials before testing in battery

Discussion

Synthesis

- Two and three layers have been demonstrated: the possibility of doing single layer as well
- Use of non-nitrate precursors or slow heating rate to avoid sudden decomposition

Battery

- Adsorption gives a good indication of cycle life, but limited information of rate capability
- Selection of materials that have shown good catalytic performance for the SRR

Conclusion

Controlled synthesis of multi-layered nanospheres via careful control of calcination

Possibility to expand to other oxides as well

Increased adsorption for the MLV due to its higher surface area

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