

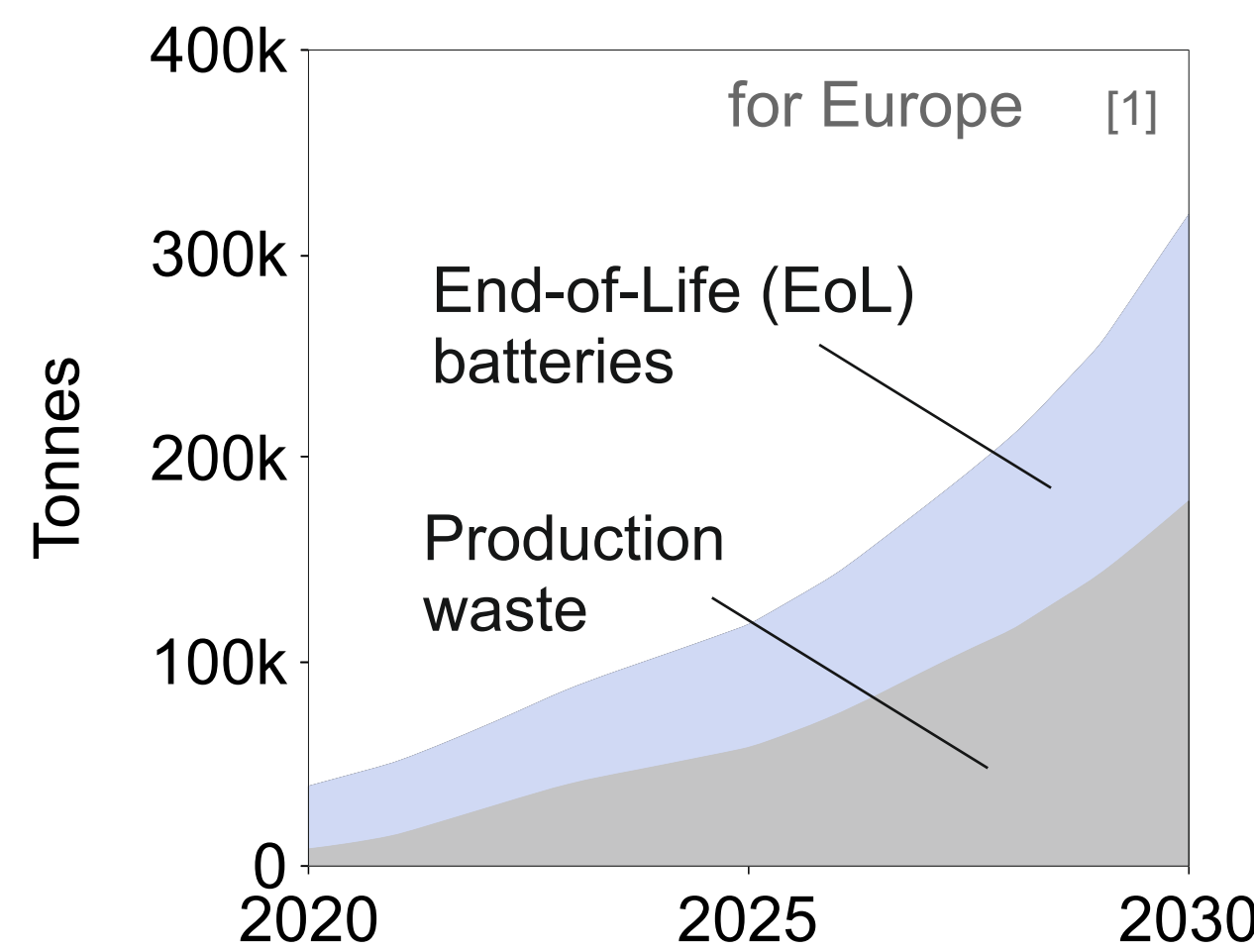
Mass transfer of multi-component solvent mixtures in porous structures during recycling of lithium-ion batteries

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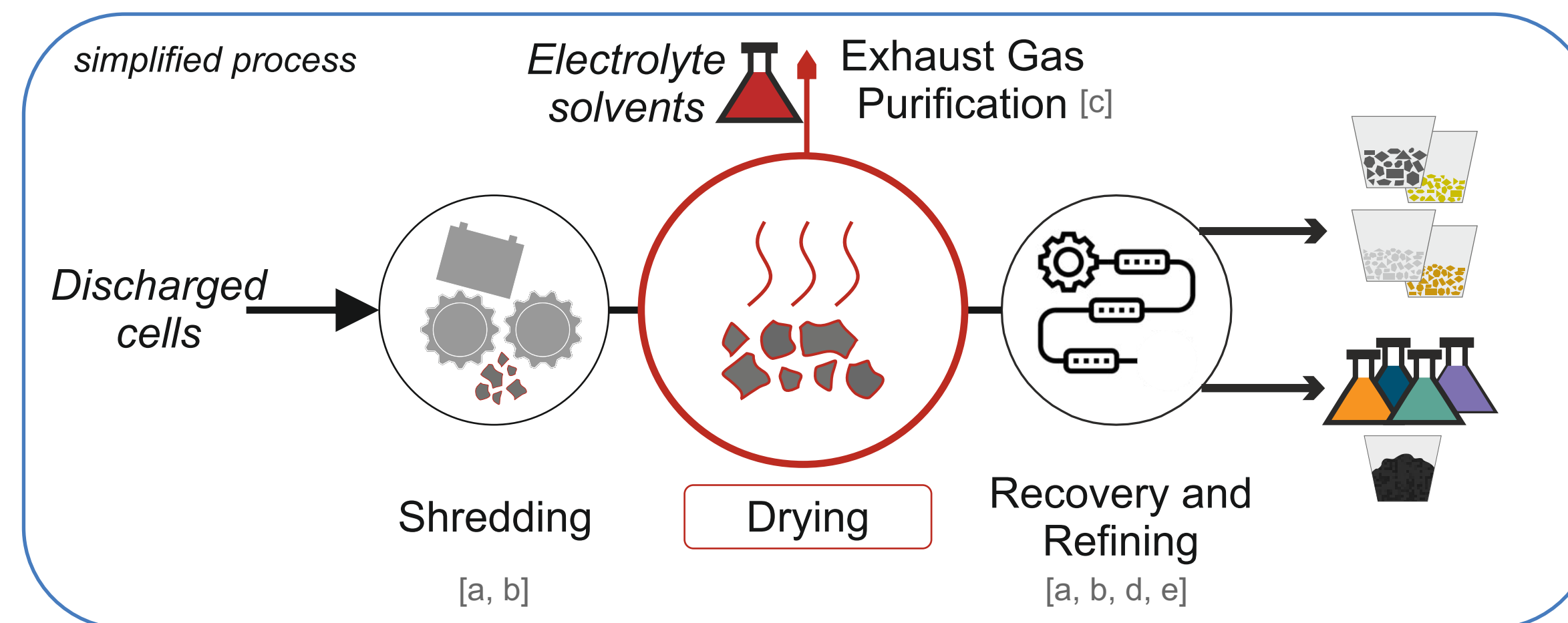
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Motivation and Approach

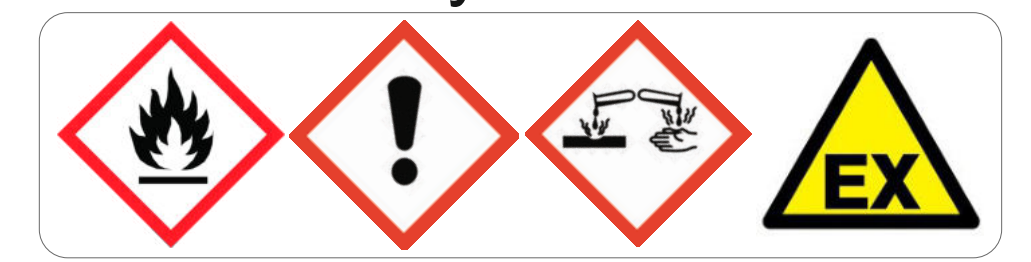
Efficient battery recycling processes for a sustainable rapidly growing market



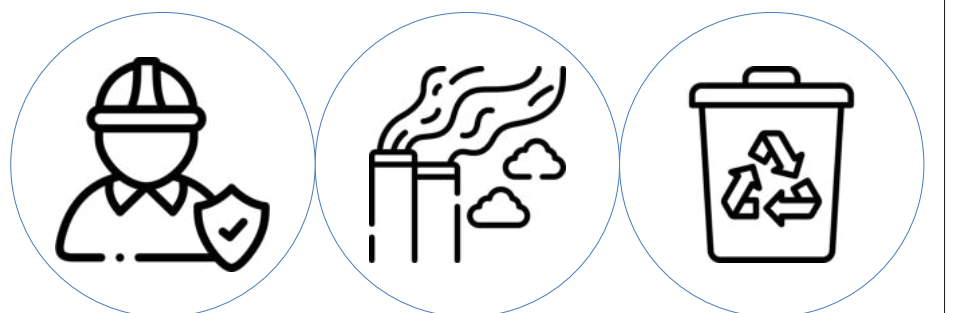
Mechanical-hydrometallurgical process for increased material recycling rate



Thermal drying of shredded material for early stage removal of electrolyte solvents

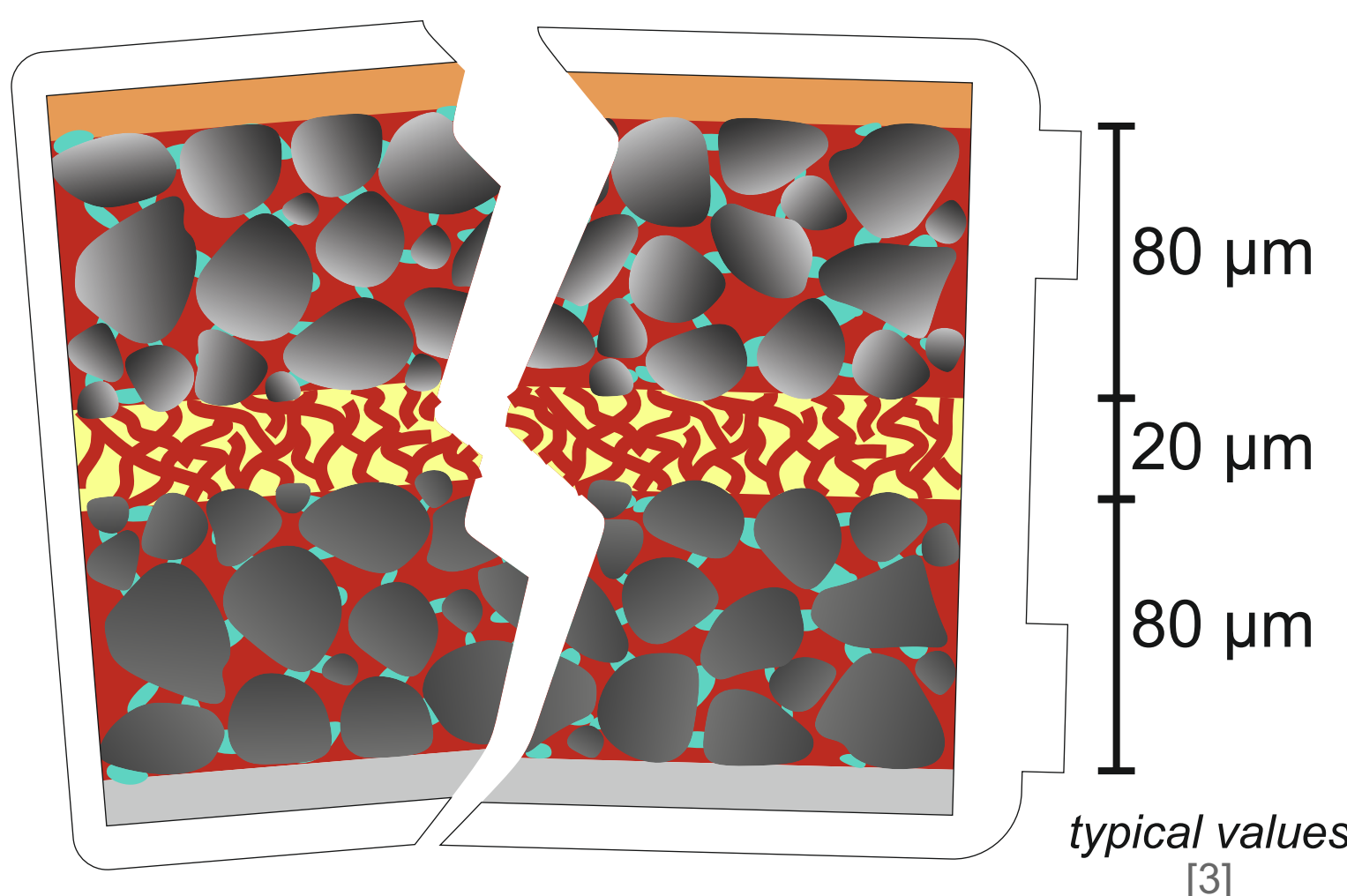
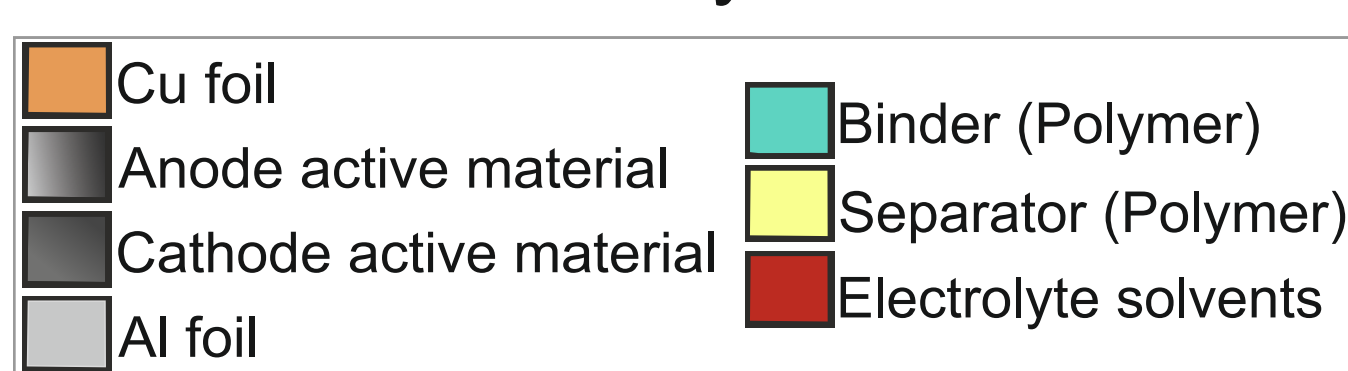


High safety and low emission processes with easy material handling

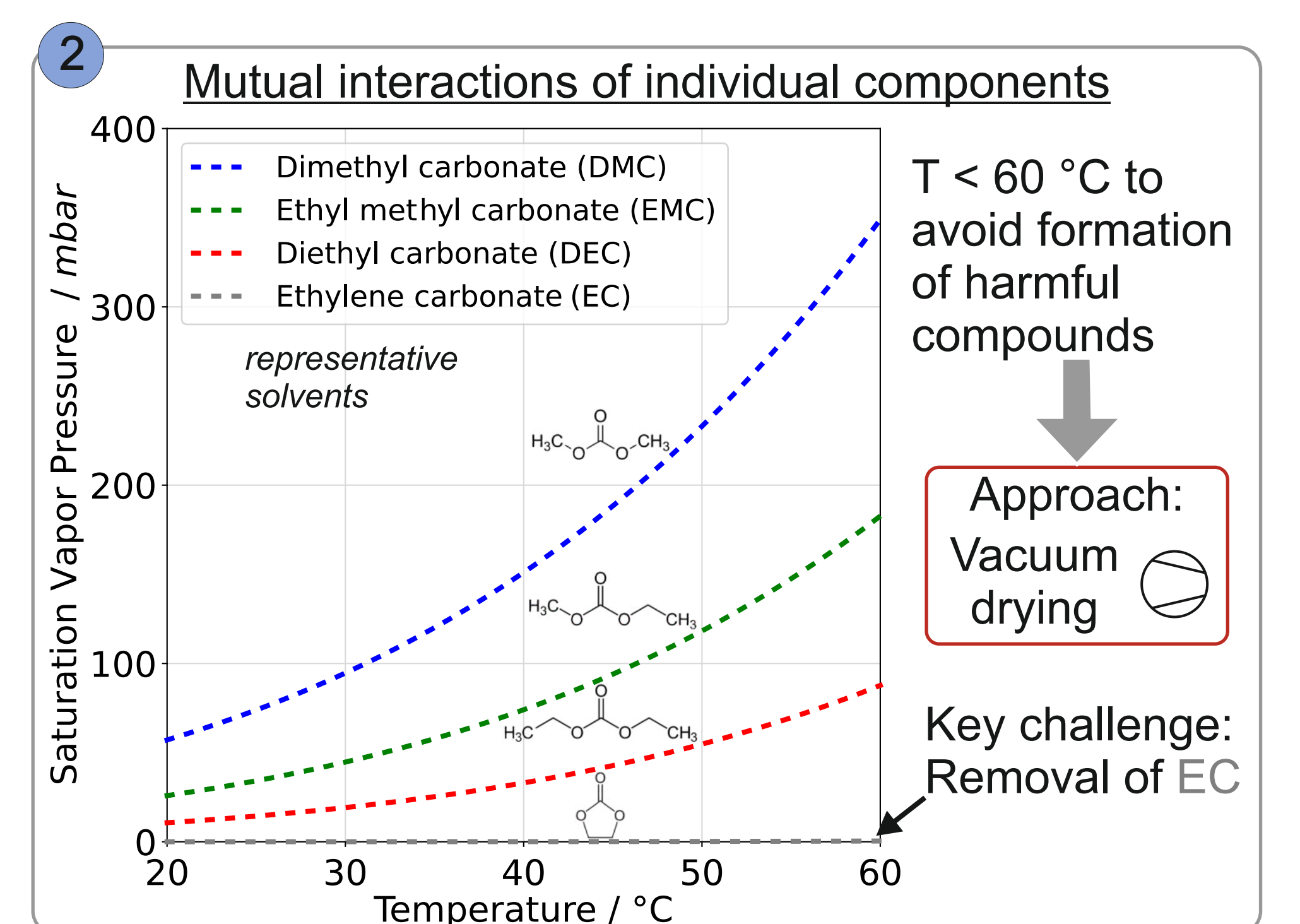
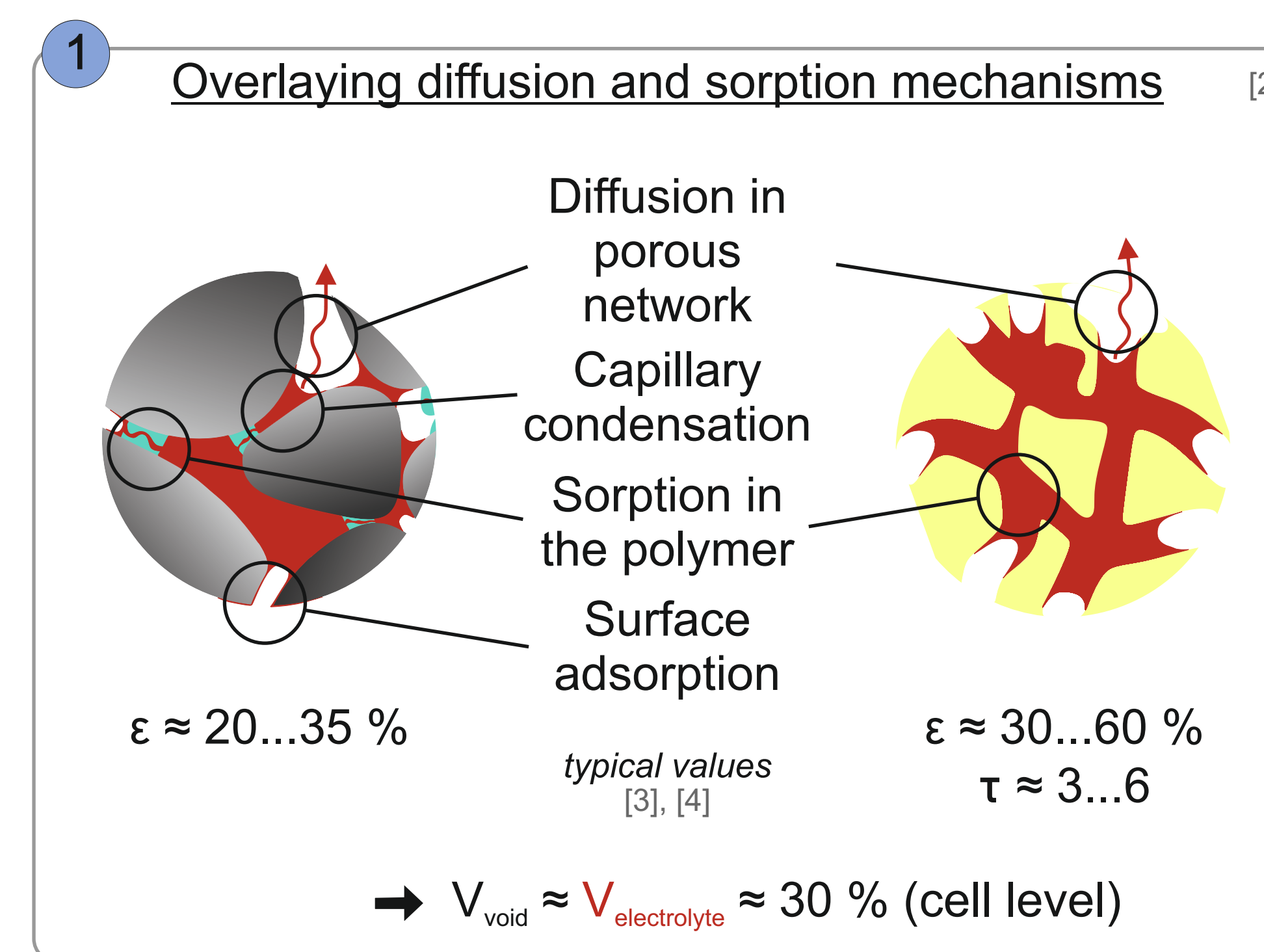


Challenges

Components of a lithium-ion battery cell

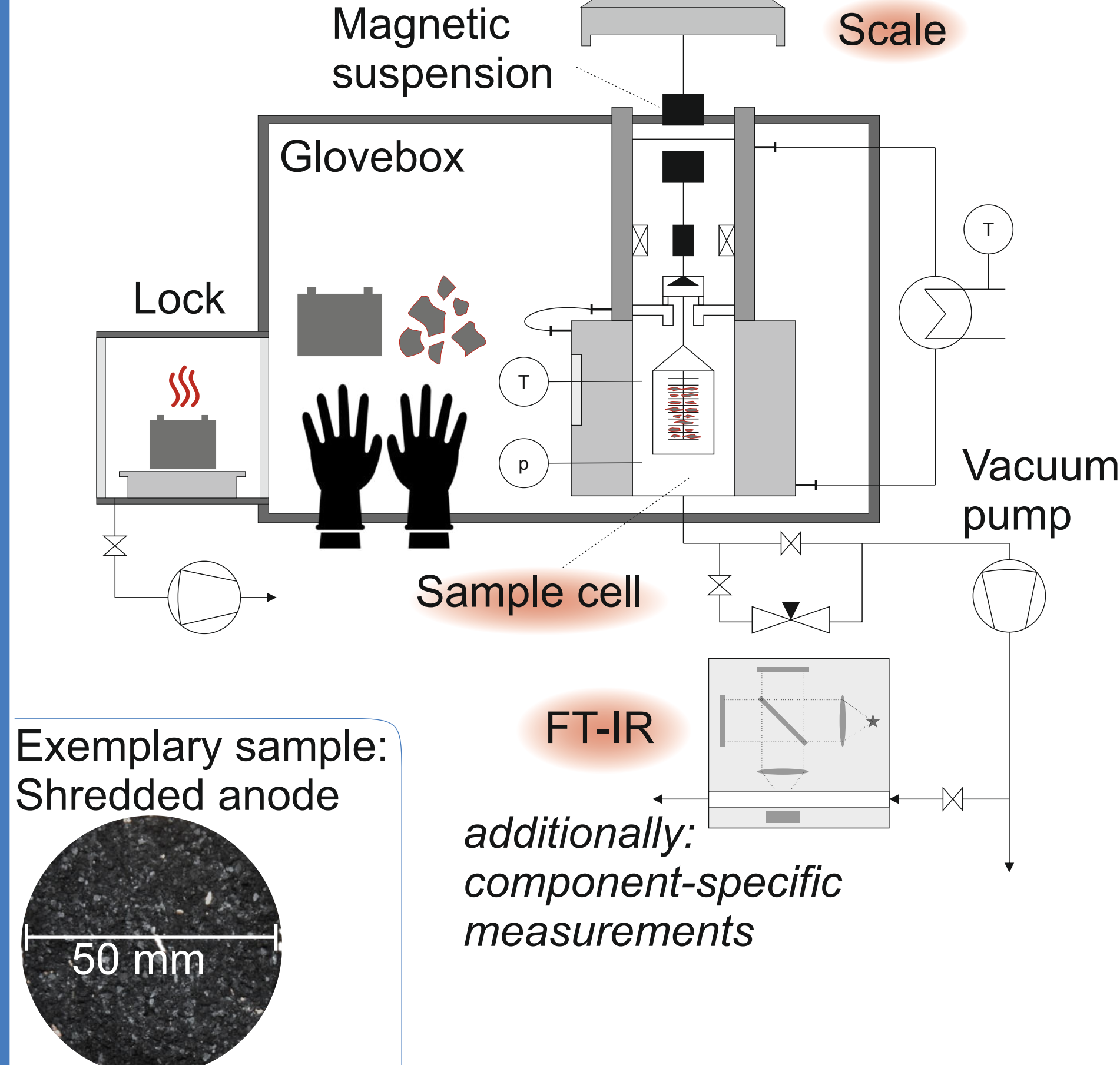


Porous and particulate components wetted with multi-component solvent mixtures



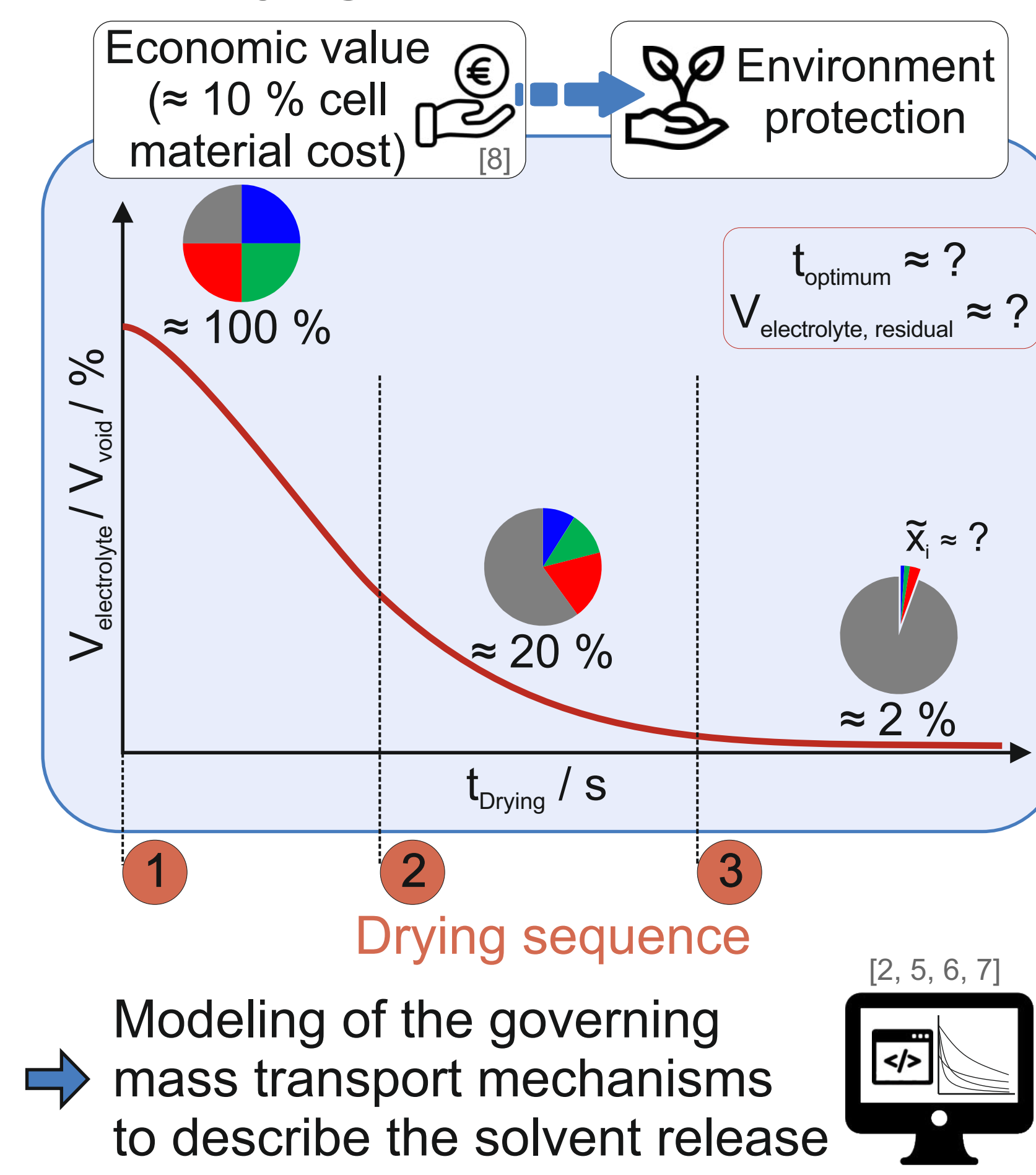
Experimental set up

Gravimetric measurement of mass transport kinetics [5, 6, 7]



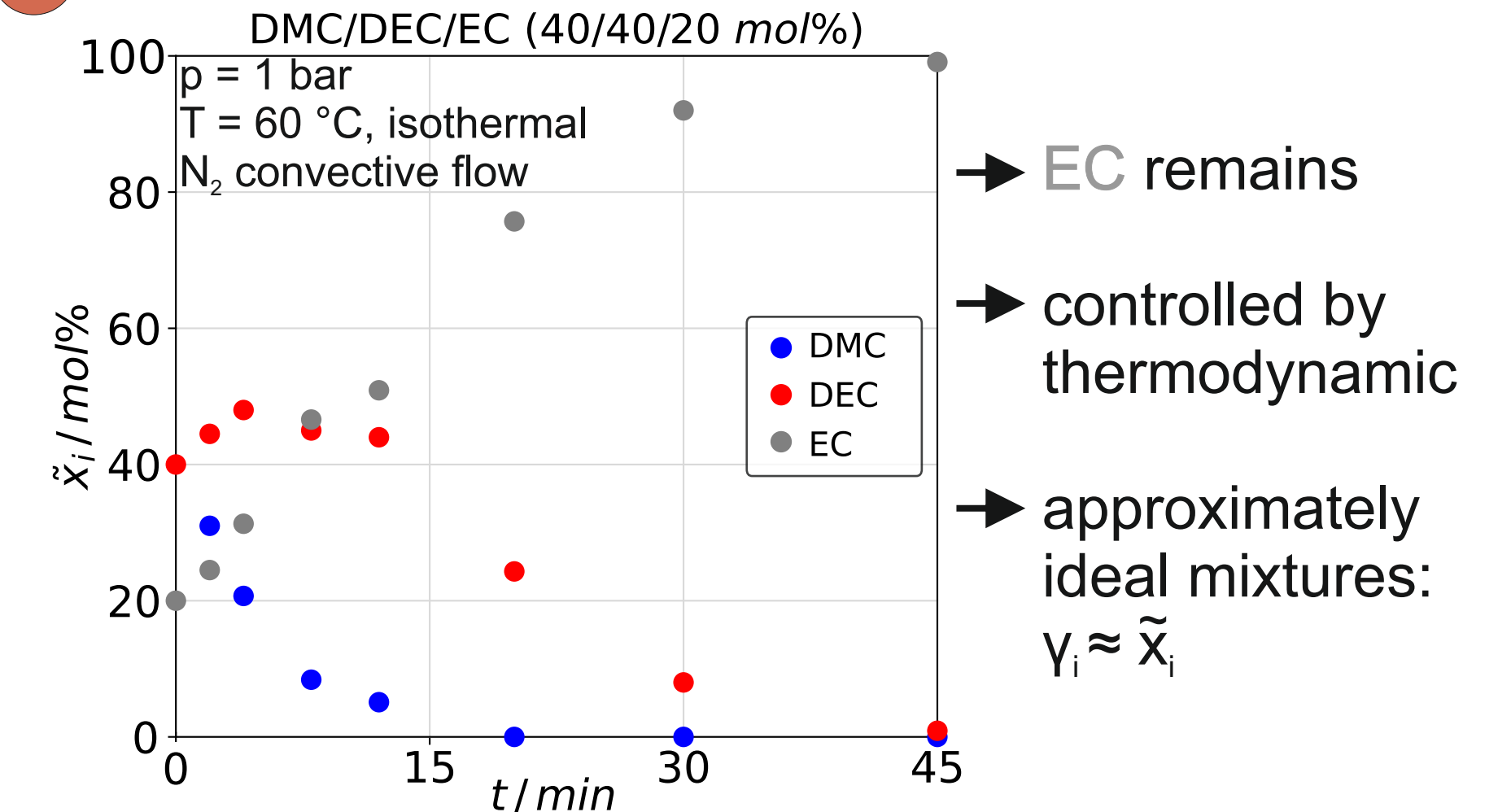
Objective

Prediction of drying time and conditions

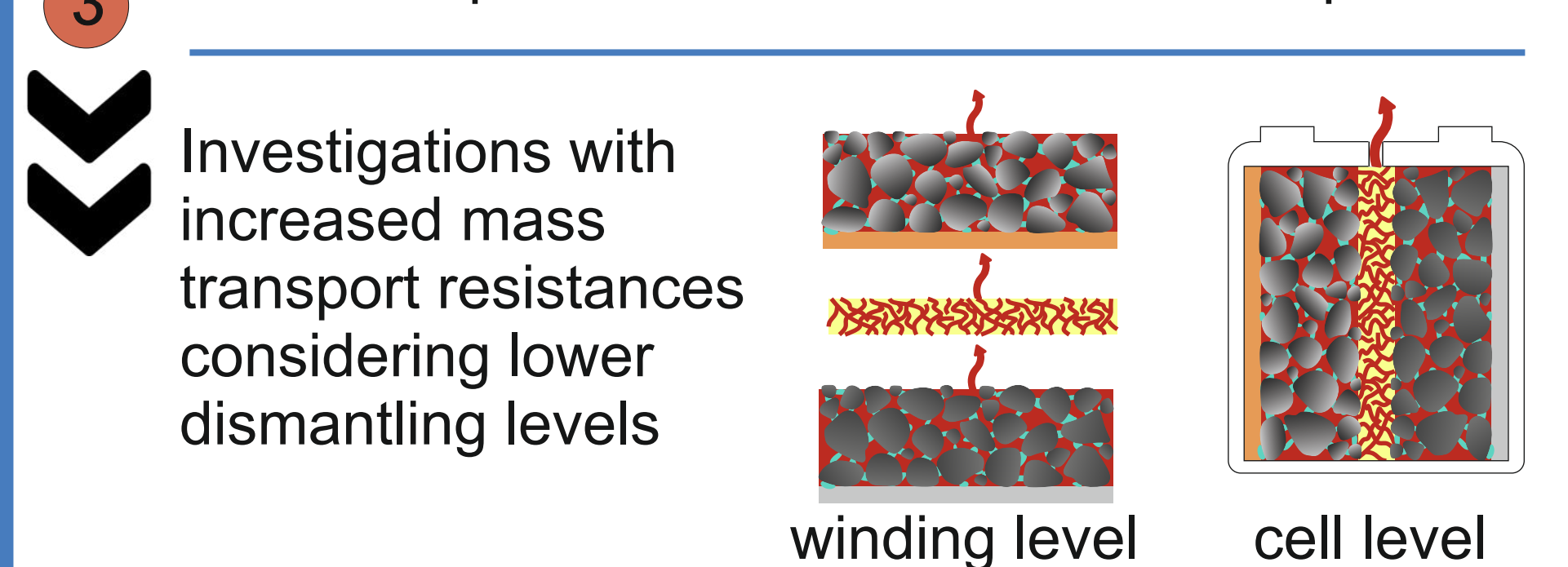


Results and Outlook

1 Investigation of the evaporation of solvent mixtures



2 Investigation of... the mass transport through porous network and the sorption behavior of individual components



[1] <https://circularenenergystorage.com/articles/2020/12/15/analysis-of-the-new-eu-battery-regulation> (24.08.2022)
[2] Heckmann, T. [...] Scharfer, P.; Schabel, W. (2022): Experimental Investigation of the Temperature, Pressure, and Binder System Influence on Vacuum Postdrying Processes [...]. *Energy Technology*, 2200859
[3] Li et al. (2022): From Materials to Cell: State-of-the-Art and Prospective Technologies for Lithium-Ion Battery Electrode Processing. *Chemical Reviews*, 122, 903-956
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[5] Eser, J. [...] Scharfer, P.; Schabel, W. (2020): Diffusion kinetics of water in graphite anodes for Li-ion batteries. *Drying Technology* 40:6, 1130-1145
[6] Eser, J. [...] Scharfer, P.; Schabel, W. (2020): Moisture Adsorption Behavior in Anodes for Li-Ion Batteries. *Energy Technology*, 8, 1801162
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[8] Schmuck, R. et al. (2018): Performance and cost of materials for lithium-based rechargeable automotive batteries. *Nature Energy*, 3, 267-278