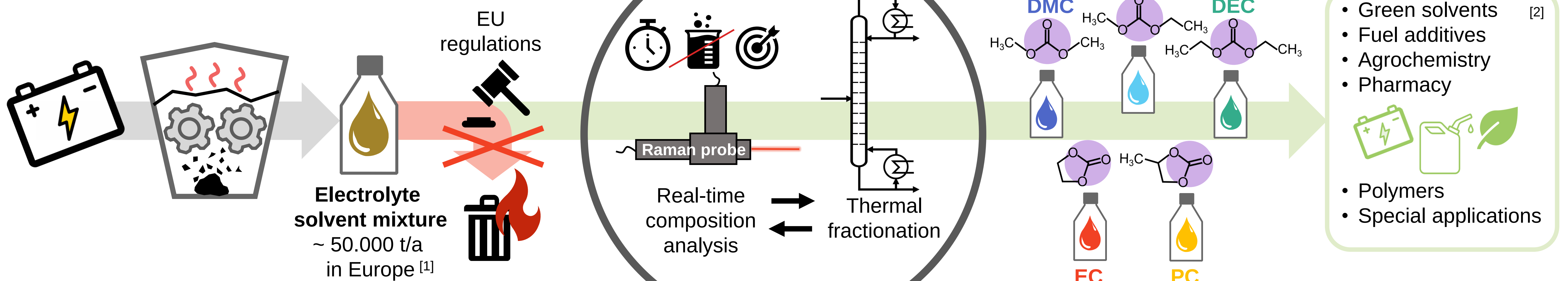


Raman Composition Analysis of Electrolyte Solvent Mixtures obtained from Lithium-ion Battery (LIB) Recycling

Tom Goldberg, Volker Herdegen, Andreas S. Braeuer

The concept ...



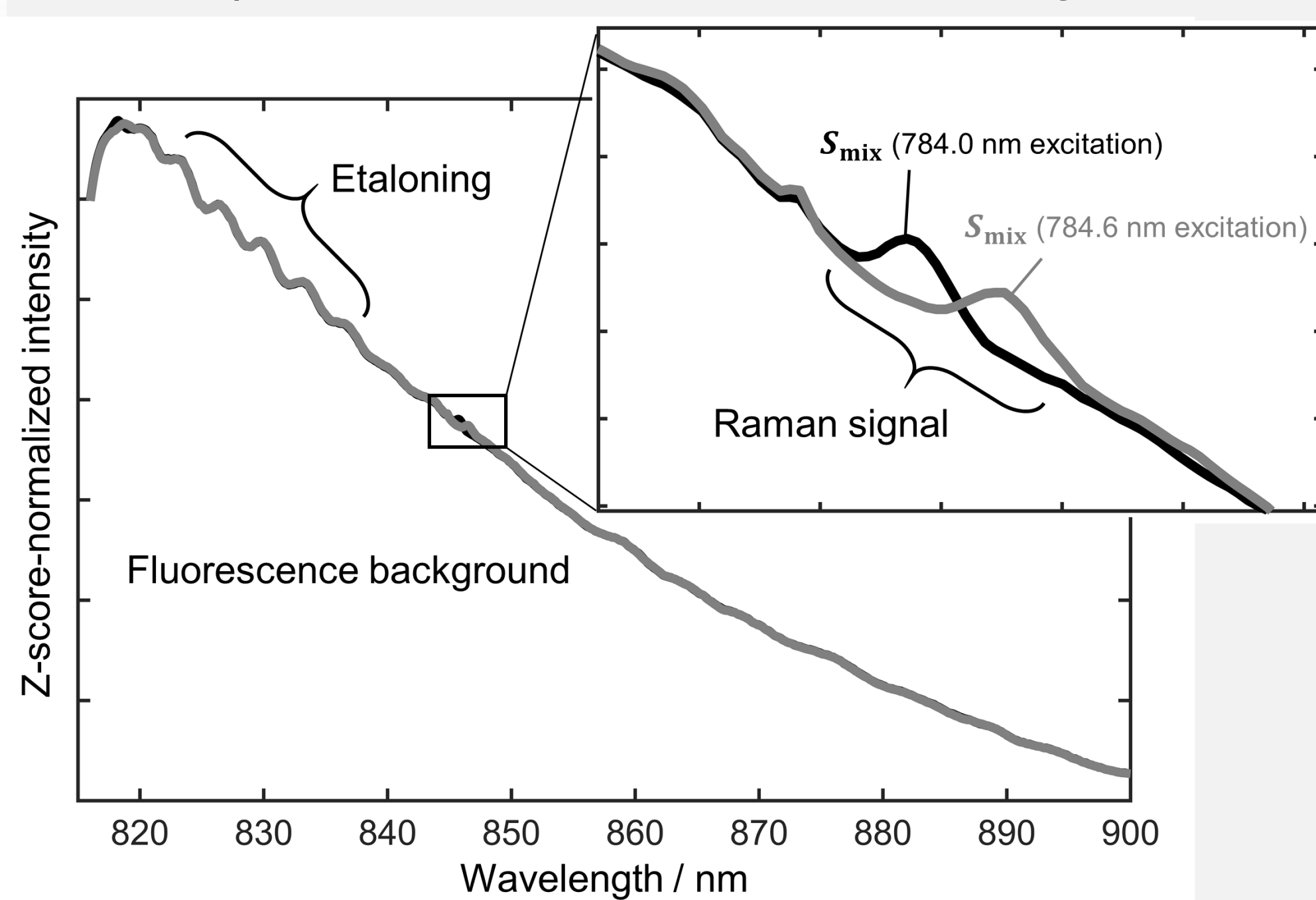
The details ...

High contaminations → **SERDS***
* Shifted excitation Raman difference spectroscopy

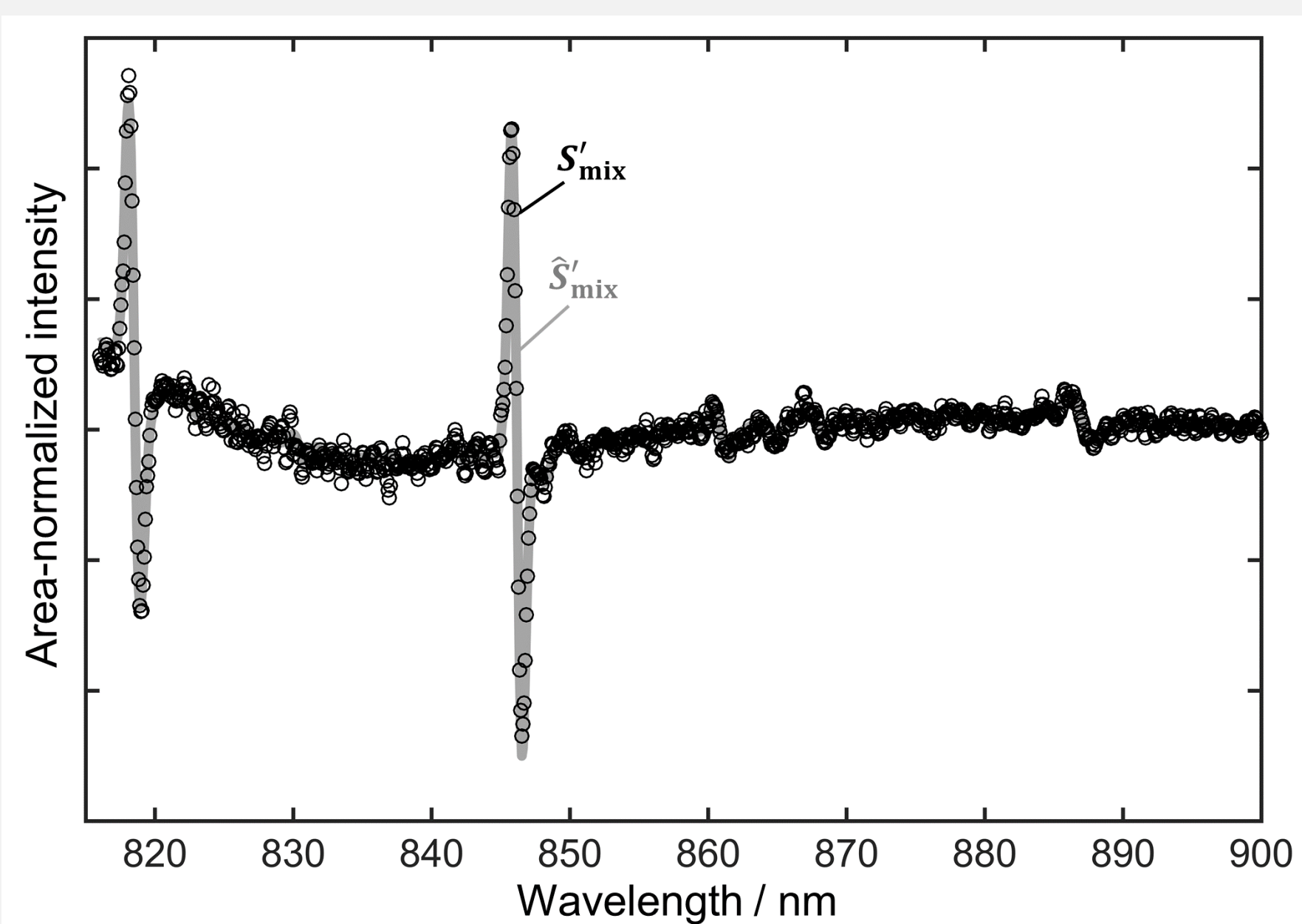
Low contaminations → **Conventional Raman**

Reliable signal recovery for rapid process decisions [3]

Raw spectra with shifted excitation wavelength



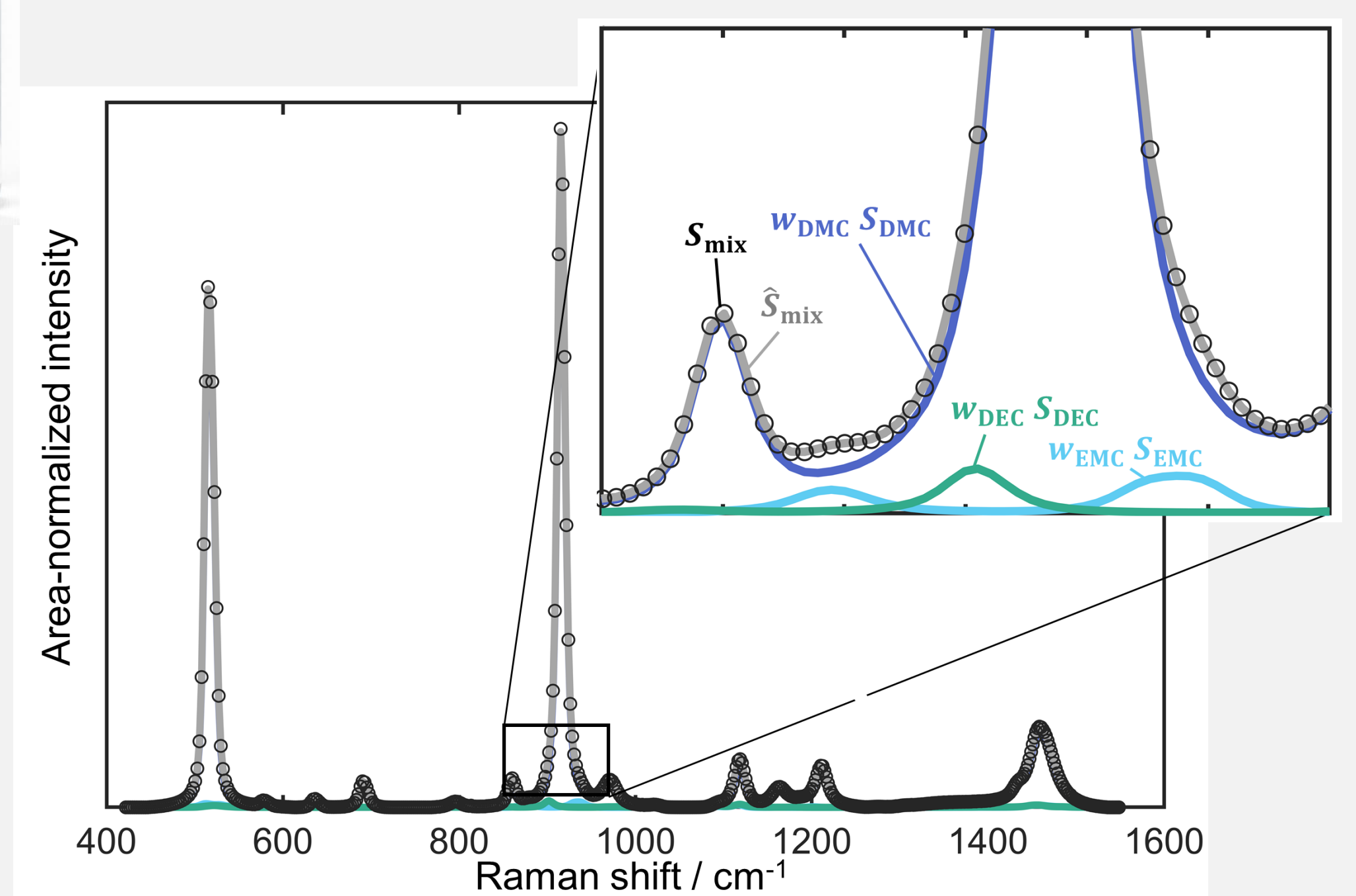
SERDS spectrum (recovered Raman signal)



Mixture quantification (typical accuracy < 3 mol%)

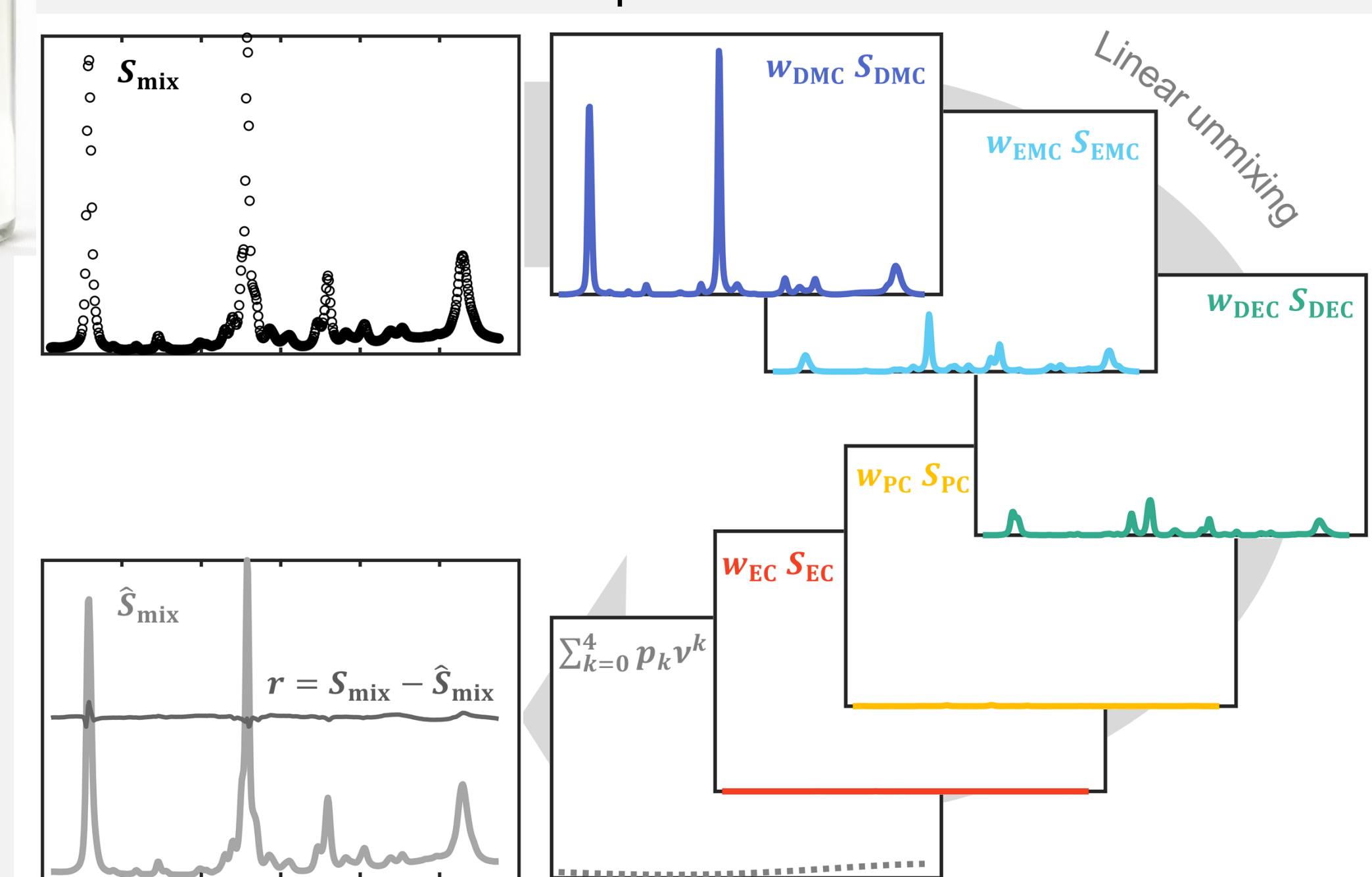
Low limit of detection for purity control (< 0.5 mol%)

Trace analysis



High-quality spectra for accurate composition analysis (< 1 mol%) [3]

Mixture quantification



The takehome ...

- Recovery of LIB electrolyte solvents for sustainable battery production or second-life use as important platform chemicals
- Non-invasive **real-time monitoring for adaptive thermal separation** and quality control of fluctuating recycling streams
- Raman spectroscopy as readily implementable process analytical technology (PAT)
- Process-tailored mixture analysis across a wide range of sample impurities by **adapted Raman spectroscopy**

[1] T. Schmaltz, Recycling of lithium-ion batteries will increase strongly in Europe: Quantity scenarios of lithium-ion batteries for recycling and their origin, 2023

[2] G. Trapasso, F. Aricò, DOI: 10.1039/d5gc00536a

[3] T. Goldberg, R. Haseneder, A. S. Braeuer, DOI: 10.1039/D6AY00600K