Technology Offer

Volume-fraction-based determination for LLPS

Quantitative molecular assessment in phase-separated biomolecular systems

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Background

Liquid-liquid phase separation (LLPS) creates biomolecular condensates, which are key for cell function and signaling in development and disease. Measuring the concentrations within these dense phases is essential for understanding the formation, material properties, and dissolution of condensates. However, standard approaches need large sample volumes or rely on fluorescent tags, introducing artifacts and complicating quantification. A reliable, label-free quantification method would empower systematic studies in molecular biology and biomedicine, increase measurement precision, and broaden access to LLPS research.

Technology

Researchers from the Max-Planck-Institute of Molecular Cell Biology and Genetics in Dresden have developed a volume-fraction-based approach leveraging mass and volume conservation in closed systems, enabling simultaneous determination of dilute and condensed phase concentrations in LLPS for proteins or nucleic acids. The workflow is compatible with standard microscopy and microfluidic setups and works label-free or with minimal labeling.

Key Advantages

- Quantitative binodal curves from minimal sample volumes
- Label-free compatible, avoiding artifacts from fluorescence tags
- 3-fold higher precision than conventional measurements for condensate composition
- Scalable to in vitro, in vivo, and multi-well screening assays

Applications include rapid phase diagram mapping, screening for bioactive compounds modifying phase behavior, and diagnostic analyses for diseases involving aberrant phase separation.

Opportunity

We are seeking partners for licensing or collaboration to adapt and further develop this technology for broader clinical, pharmaceutical, and research applications.

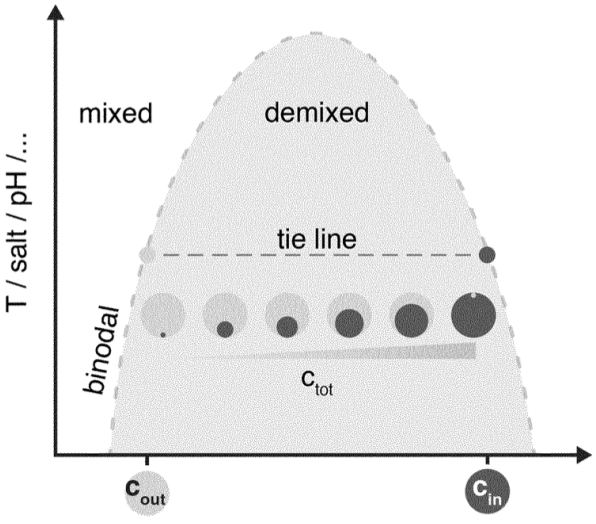

Figure 1 *Schematic of the binodal of a phase diagram with dilute branch c_{out} and condensed branch c_{in} concentrations connected via a tie line.*

Patent Information

The PCT application WO2023233040A1 was filed in 2025.

Scientific Publication

McCall, P. et al. (2020)
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