

35th IIR-ASMat Seminar (IIR-ASMat & CLS 合同セミナー)

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Light-driven control of coacervate phase transitions

Liquid-liquid phase separation (LLPS) provides a powerful route to form biomolecular condensates that dynamically regulate biochemical processes in living systems. Harnessing such behaviour in minimal synthetic systems requires strategies to control phase transitions out of equilibrium. I will present photo-responsive coacervate droplets as minimal platforms in which phase behaviour can be programmed using light as an external energy input. Using photoswitchable azobenzene building blocks, we achieve reversible and spatiotemporally resolved control over coacervate assembly and dissolution. These dynamic environments enable regulation of molecular partitioning and support non-enzymatic DNA polymerization, where changes in composition feed back onto phase behaviour. Extending this approach to multicomponent systems provides access to light-driven switching of multiphase organization, including in minimal nucleotide-based droplets. I will also show how coupling light-actuated phase transitions with microfluidics gives rise to non-equilibrium behaviours such as droplet budding and division. Overall, this approach establishes light-driven coacervates as minimal systems to investigate dynamic compartmentalization in synthetic condensates and protocell-like systems.

日時：2026年6月8日（月）15:30~16:30

場所：東京科学大学 横浜キャンパス S8棟 1階 レクチャールーム

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