



## Special issue: Current topics in liquid–liquid phase separation

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Recently, the presence of biomolecular condensates composed of proteins and nucleic acids without surrounding membranes inside living cells has been unveiled as liquid-like droplets formed via liquid–liquid phase separation (LLPS) of the biopolymers [1]. Compartmentalization by LLPS can facilitate biochemical processes such as signal transduction, metabolism, and gene regulation, which are profoundly related to various cellular functions and even disease states [2]. This discovery of such biological significance is supported by decades of accumulated research in the field of polymer science. Specifically, it is underpinned by the theoretical framework established by Flory and Huggins in the 1940s, extensive studies on phase separation in polymer blends and copolymer systems conducted during the 1960s and 1970s, and detailed analyses of phase separation processes using scattering techniques and various microscopy methods that have advanced since the 1980s. Also, recent progress of molecular simulations plays important roles for dissecting the driving force of LLPS and machine-learning approach is useful to predict the formation of biomolecular as well as artificial condensates. This emerging and multidisciplinary field of research would significantly influence modern polymer science.

In this special issue, to cover a wide range of research topic relevant to LLPS, we invited outstanding researchers to this issue and collected 4 Original Articles, 1 Rapid Communication, 6 Focus Reviews, and 3 Reviews, which can provide the readers with an overview of this rapidly growing research field. We sincerely appreciate all authors and referees for their contribution to this issue. Since 2012,

*Polymer Journal* has published special issues on the related topics, e.g., self-assembled soft materials [3–6], peptide materials [7], carbohydrate materials [8], and biorelated materials [9, 10]. As with recent special issues [11, 12], we hope that this special issue is also valuable for the readers of this journal.

### Compliance with ethical standards

**Conflict of interest** The authors declare no competing interests.

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