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Phase separation induced by ladder-like polymer-polymer complexation ISSEI NAKAMURA, AN-CHANG SHI, McMaster University — Complexation between donor and acceptor polymers in solvent through specific binding interactions such as hydrogen bonding is studied using a self-consistent field theory. In the model, two donor and acceptor polymers are capable of forming a ladder-like duplex structure. The duplex formation discontinuously occurs with an abrupt variation in entropy, resulting in a first-order transition. Moreover, solvent-induced complexation is discussed. In this case, the duplex polymer is stabilized by solvent-polymer interactions rather than the specific binding interactions. Various types of unconventional coexistence curves are derived from the model. A phase separation with decreasing the χ-parameter between duplex polymer and solvent can be induced, leading to a lower critical solution temperature (LCST) behavior. Critical points at which two, three, and four phases coexist are also obtained. Under certain conditions a homogeneous phase becomes unstable when the polymer chain length is decreased, in contrast to the standard Flory-Huggins theory.

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