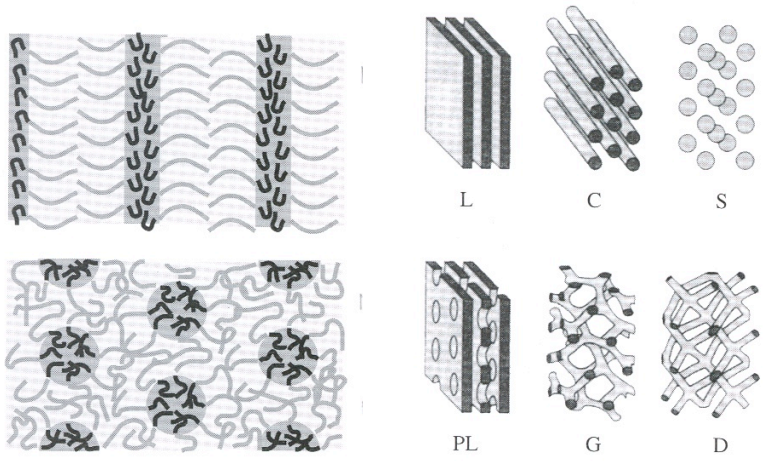
Self-Assembly in Polymers [pln58]

Blends of homopolymers have a strong tendency to phase separate as explained in [pln48]. The segregation is driven by an enthalpic gain $\Delta H < 0$ due to a lowering of interaction energies. The entropic cost $\Delta S < 0$ is reduced by the mobility constraints due to polymerization.

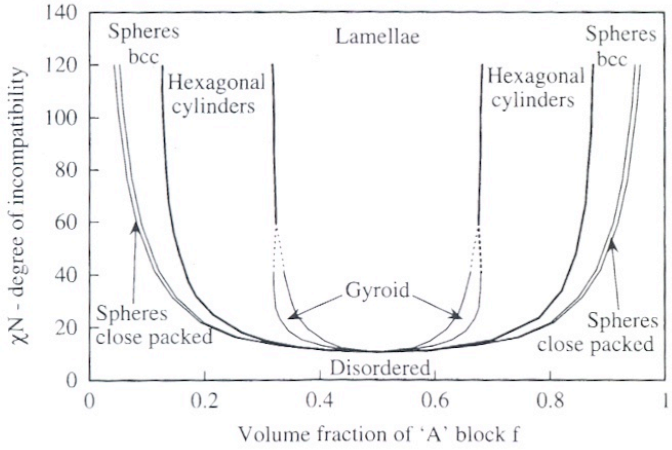
In ternary mixtures of homopolymers A, B and block copolymers AB the latter assumes a role akin to amphiphiles.

In the melt of a diblock copolymer where the two blocks have significantly different lengths, complex diagrams of microphase separation are realized.

Lamellar morphology has plane interfaces of optimized thickness [pex58]. There exist multiple morphologies with curved interfaces.



L: lamella, C: cylinders, S: spheres,
PL: perforated lamellae, G: gyroid, D: double diamond.



[images from Jones 2002]