

## Controlling hierarchical self-assembly of diblock copolymers

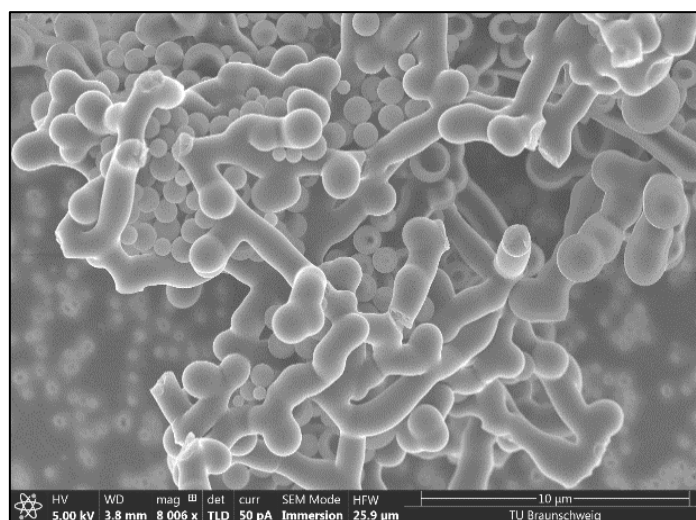
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The self-assembly of molecules into complex hierarchical structures is a fundamental step in the development of functional materials and nanodevices. For this, it is indispensable to guarantee structural precision, which in turn can only be achieved through the enlightenment of the self-assembly mechanisms and thus control.

A very fast and easy way to produce hierarchical structures is the microphase separation of block copolymers in liquids. The polymer is first dissolved in a solvent which has a high solubility to both blocks. After adding a non-solvent for one block the self-assembly will be triggered. The prevailing combination of thermodynamic and kinetic driving forces can result in many different and interesting morphologies such as vesicles, lamellae structures, network-like structures (see Figure 1), cylindrical structures etc..

For this specific case, a comprehensive understanding and thus control over the self-assembly behavior of the block copolymer polystyrene-block-polyacrylic acid is achieved through systematic investigations of process and formulation parameters. In this study, the influence of type and amount of solvents and additives, injection of the selective solvent and mixing intensity during the phase separation on the morphology of the polymeric structures will be explained. Based on these findings specific phase diagrams of the polymer will be derived.



**Figure 1.** SEM image of a giant network-like structure of self-assembled polystyrene-block-polyacrylic acid monomers in a tetrahydrofuran-water mixture.

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