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“Mixing/demixing in polymer blends“

In this dissertation we use **light scattering** and **microscopy observation** methods to study the morphology evolution process during phase separation for different systems (polystyrene/polymethylphenylsiloxane (PS/PMPS), 4-cyano-4'-n-octyl-biphenyl/polystyrene (8CB/PS), n-dodecyl hexaoxyethylene glycol monoether/polyethylene glycol/water (C 12 E 6 /PEG/H 2 O). The results from light scattering experiments are correlated with the images obtained by optical microscopy observations.

It was found that when the growth of the first peak in the light scattering (corresponding to the bicontinuous network) becomes very slow (essentially pinned down) the breaking-up process of the bicontinuous network into elongated domains develops.

Following light scattering experiments, optical microscopy observations and computer simulations for PS/PMPS binary mixture we found that one peak in the light scattering spectra corresponds to the bicontinuous network. The rising of the left part (at small wavevectors) of the spectra corresponds to the local partial network breaking during the coarsening process. It results from the formation of polydisperse small droplets $\langle D \rangle \sim 1 \mu m$. The double peak can correspond to elongated domains with large droplets forming after the percolation-to-droplets transition starts. It is also possible to obtain a double peak from the polydisperse droplets. After the large, nearly monodisperse droplets are formed, the intensity peak has a maximum out of the wavevector range, detected in our experiments.

We found that the main mechanism of domains growth during late stage of decomposition process is the **coalescence-induced coalescence mechanism**. All our systems behave similarly in the late stage of phase separation and therefore we may conjecture that the mechanism of coalescence-induced coalescence is rather general.

We observe a dimensional crossover in the coalescence-induced coalescence via flow, from $L(t) \sim t$ to $t^{1/3}$.