Analysis of length scale and interfacial curvature of phase-separating polymer films

Two-phase polymer films are commonly used as pharmaceutical coatings for controlled drug release applications. In an ongoing PhD project, we characterize the impact of e. g. weight fractions of the polymers and processing conditions on the structure that is formed through phase separation, typically through the spinodal decomposition mechanism. The structures are imaged using confocal laser scanning microscopy (CLSM). The project involves image processing for quantitative analysis of the length scale of the structure as a function of time and for the shape and curvature of the interfacial surface. This analysis entails using multiple image processing tools such as filtering techniques and Fourier (FFT) domain analysis for wavelength/frequency analysis. The proposed MSc project is focused on spatial statistics and image analysis. The aim is to explore image analysis methods for analysis of length scale and interfacial curvature of phase-separating polymer films, using existing experimental data as well as simulated data. Concretely, to implement methods for synthetic image data generation using Gaussian random fields and other simulation techniques, to investigate both FFT- and non-FFT-based methods for length scale/wavelength analysis (the latter could be e.g. covariance functions, chord length distributions), curvature estimation methods, and relating local curvature to local length scale. The project will be supervised by Magnus Röding at RISE. You can contact him by email magnus.roding@ri.se.

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