

Phase separated structures of concentrated polymer solutioons

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▶ **To cite this version:**

Patrick P. Guenoun, Hervé Manzanarez, Hernan Garate, Denis Bouyer, Andre Deratani, et al.. Phase separated structures of concentrated polymer solutioons. Bordeaux Polymer Conference 2018, May 2018, Bordeaux, France. cea-02340260

HAL Id: cea-02340260
https://cea.hal.science/cea-02340260

Submitted on 30 Oct 2019

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PHASE SEPARATED STRUCTURES OF CONCENTRATED POLYMER SOLUTIONS

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Phase separation of concentrated homopolymer solutions is both of fundamental interest (the large difference in viscosity/elasticity of the two phases can lead to unusual behaviors) and of practical importance (novel porous structures can be made by this process). I will first review how 2D phase-field simulations (Fig.1) reveal the influence of the mobility dependance with concentration for capturing features of phase separation like growth laws.[1] On the experimental side I will examine various water-soluble polymers and show how anomalous phase diagrams seem to be closely connected to unusual features of arrested-like phase separation as evidenced by light scattering and confocal microscopy. Thin films of these polymer solutions were used for making membranes (Fig. 2), avoiding the use of organic solvents. [2, 3, 4] The case of homo-polyelectrolytes is also of great interest since the theory is still controversial, as I will briefly recall. First results will be presented about phase separation upon changes in salt concentration, polymer concentration and temperature for a polyelectrolyte whose structure is also promising for membranes.

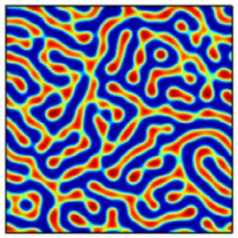


Figure 1 – 2D Simulation of phase separation in polymer solution

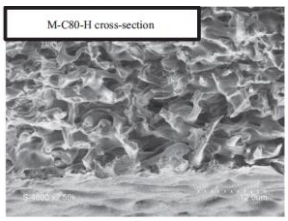


Figure 2: Membrane made by phase separation of a PVA solution

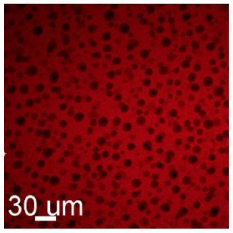


Figure 3: Confocal image of a phase separating polyelectrolyte

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