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Phase separation in artificial vesicles driven by light and curvature MELISSA RINALDIN, WIM POMP, THOMAS SCHMIDT, LUCA GIOMI, DANIELA KRAFT, Leiden University, PHYSICS OF LIFE PROCESSES TEAM, SOFT AND BIO MECHANICS COLLABORATION, SELF-ASSEMBLY IN SOFT MATTER SYSTEMS COLLABORATION — The role of phase-demixing in living cells, leading to the lipid-raft hypothesis, has been extensively studied. Lipid domains of higher lipid chain order are proposed to regulate protein spatial organization. Giant Unilamellar Vesicles provide an artificial model to study phase separation. So far temperature was used to initiate the process. Here we introduce a new methodology based on the induction of phase separation by light. To this aim, the composition of the lipid membrane is varied by photo-oxidation of lipids. The control of the process gained by using light allowed us to observe vesicle shape fluctuations during phase-demixing. The presence of fluctuations near the critical mixing point resembles features of a critical process. We quantitatively analyze these fluctuations using a 2d elastic model, from which we can estimate the material parameters such as bending rigidity and surface tension, demonstrating the non-equilibrium critical behaviour. Finally, I will describe recent attempts toward tuning the membrane composition by controlling the vesicle curvature.

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