

Experimental study of a second order transition: out of equilibrium fluctuations, aging and electric field effects.

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Out of equilibrium physics is a very active and fascinating research topic, both from theoretical and experimental points of view. Aging problems, study of thermal fluctuations, relaxation towards equilibrium after a temperature quench... are still very open questions. To study these complicated problems, we choose to use experimental systems that are quite simple and well-known at equilibrium. But even in this kind of systems, there are only few out of equilibrium theoretical models.

We study binary mixtures of liquids, having a demixing transition as a function of temperature from one homogeneous phase to two phases, each one rich in one element. The critical point of this transition belongs to the Ising 3-D universality class, so all equilibrium exponents are perfectly characterized. On these systems, the natural variable is temperature. But, in the out of equilibrium context all variables do not need to be equivalent. The systems we choose also have good responses to electric fields. So we want to perturb these systems with high electric fields or high gradients of electric fields. In fact, according to Landau, only the gradient of the electric field is supposed to have an effect on the transition. We are starting to develop high gradient experiments. We are also interested on high electric fields that will texturise samples and influence their dynamics. High (gradient of) electric field can also be used as an extra control parameter to quench the samples at the critical point and study its slow relaxation towards equilibrium.

During the last few years, the team developed expertise in binary mixtures and also apparatus to study them such as AFM (Atomic Force Microscopy in liquid medium), SNOM (scanning near-field optical microscopy), DDM (differential dynamical microscopy), DLS (dynamical light scattering), optical tweezers, macroscopic dielectric measurement, both response and fluctuations... The objective of the post-doc will be to study the high dielectric (gradient) effect on the demixing transition : displacement of the critical point, aging, possible violation of fluctuation dissipation relation... with particular focus on the dynamics on the system. This is an experimental work needing a taste for precise and difficult experiments and also strong link with theoretical predictions. Since the subject is very open, the post-doc will have some freedom to choose the focus of his work.

- *One year founding for the moment.*
- *We are asking the founding of this post-doc from CNRS, so we need a good candidate before April 15th. So, any good applicant contacting us as soon as possible will be considered with very high interest. Due to the founding, the post-doc is supposed to start on July 1st 2016.*
- *The salary will be the standard CNRS one: around 2000 €, for a recent doctor.*