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Temperature gradient induced solvent coarsening around colloids

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Using mesoscopic numerical simulations and analytical theory we investigate
the coarsening of the solvent structure around a colloidal particle emerging after a
temperature quench of the colloid surface. Qualitative differences in the coarsening mechanisms are found, depending on the composition of the binary liquid mixture forming the solvent and on the adsorption preferences of the colloid. For an
adsorptionwise neutral colloid, as function of time the phase being next to its surface alternates. This behavior sets in on the scale of the
relaxation time of the solvent and is absent for colloids with
strong adsorption preferences. A Janus colloid, with a small temperature difference between its two hemispheres,
reveals an asymmetric structure formation and surface enrichment around it, even if the solvent is within its one-phase region
and if the temperature of the colloid is above the critical demixing temperature T_c of the solvent.
A comparison between the emerging fluid structures above and below T_c is provided.
Our phenomenological
model turns out to capture recent experimental findings according to which, upon laser
illumination of a Janus colloid and due to the ensuing temperature gradient between its two
hemispheres, the surrounding binary liquid mixture
develops a concentration gradient.

Primary author: MACIOLEK, Anna (ICHF PAN)

Co-authors: DIETRICH, Siegfried (MPI for Intelligent Systems); ROY, Sutapa (MPI for Intelligent Systems, Stuttgart)

Presenter: MACIOLEK, Anna (ICHF PAN)

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