Complete wetting in colloid-polymer mixtures: Are renormalization group predictions measurable?

Y. Hennequin[1], D. G. A. L. Aarts[2], J. O. Indekeu[3],
H. N. W. Lekkerkerker[4], D. Bonn[1,5]
[1] *Van der Waals - Zeeman Institute, University of Amsterdam, The Netherlands*
[2] *Physical and Theoretical Chemistry Laboratory, University of Oxford, UK*
[3] *Instituut voor Theoretische Fysica, Katholieke Universiteit Leuven, Belgium*
[4] *Van 't Hoff Laboratory, Utrecht University, The Netherlands*
[5] *Laboratoire de Physique Statistique, Ecole Normale Supérieure, Paris, France*

We have made recent confocal microscopy observations of complete wetting of phase-separated colloid polymer mixtures at a glass wall. An unusually thick wetting layer of the colloid-rich phase is formed. Due to the ultralow interfacial tension between the colloid-rich and the polymer-rich fluid phases, the thermally activated roughness of the interfaces becomes big and measurable. Close to the fluid critical point the roughness of the interface between the wetting layer and the polymer-rich phase increases with increasing layer thickness: large excursions of the interface are confined in the wetting layer. The measured relationship between the roughness and the thickness of the wetting layer is in agreement with the long-standing predictions of renormalization group (RG) theory for short-range forces and complete wetting [1]. That is, we find that the values of the exponent and even of the amplitude of the layer thickness dependence on the roughness of the confined interface, are in accord with RG calculations. This is the first system that we know of for which subtle RG results for wetting are measurable.

[1] D.S. Fisher and D.A. Huse, Phys. Rev. B**32**, 247 (1985); R. Lipowsky and M.E. Fisher, Phys. Rev.B**36**, 2126 (1987).