

Abstract Submitted
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Water droplet spreading on a soluble polymer: what happens close to the contact line? LAURENCE TALINI, JULIEN DUPAS, EMILIE VERNEUIL, FRANCOIS LEQUEUX, UPMC/CNRS/ESPCI, LAURENT FORNY, MARCO RAMAIOLI, Nestlé — We have studied the spreading of a water droplet on a water soluble substrate. Numerous coupled transfer processes are involved in such a situation, leading to complex wetting dynamics. In particular, previous studies have shown the major role of water evaporation from the droplet associated with water uptake by the substrate. However, the processes at stake close to the contact line, where the substrate properties set the wetting angle, have not been understood. We present an experimental study of the phenomena occurring within distances ranging from 10 to 1000 μm from the contact line of a water droplet spreading on a food polymer layer. We have evidenced a wrinkling pattern inside the droplet close to the contact line, and suggest it results from the swelling of the constrained polymer layer before it dissolves. In addition, using an optical method based on the analysis of Newton's rings, we have measured the hydration profile of the substrate ahead the contact line. We show that the profiles can be understood as a result of the evaporation/water uptake process through air combined with direct water diffusion in the substrate from the liquid wedge.

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