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Wetting dynamics with solidification on cold substrates. REMY HERBAUT, PHILIPPE BRUNET, LAURENT LIMAT, MSC, Paris Diderot, LAURENT ROYON, LIED, Paris Diderot, LIED, PARIS DIDEROT TEAM, MSC, PARIS DIDEROT TEAM — We study the contact line dynamics of a continuously fed liquid drop on a substrate of temperature T colder than the freezing temperature Tf. The substrate is put on a translation state, moving at constant velocity, and the upper part of the drop is pinned on the injection pipe. Hence, the advancing contact line is coupled to a solidification front at the solid surface that advances in the same direction. Within a certain range of substrate velocity and temperature T, the solidification can induce contact-line pinning. This pinning occurs if the velocity of the substrate is slower than a certain threshold, and leads to a discontinuous stick-slip dynamics of the contact line, while at high enough velocity the contact-line motion is continuous. We study the influence of liquid wetting properties, temperature difference (Tf-T), feeding flow-rate, and injection temperature Ti on this transition. We relate the critical velocity below which the stick-slip motion appears to the solidification velocity calculated and measured on a solid surface by Glicksman and Davis, valid in particular for dendritic crystal growth. The agreement between our data and this model is quantitatively fair.

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