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Wetting ridge growth and contact line pinning on viscoelastic solid SU JI PARK, Pohang Univ of Sci & Tech, JOSHUA B. BOSTWICK, Northwestern Univ., JUNG HO JE, Pohang Univ of Sci & Tech — Dynamic wetting behaviors on soft viscoelastic solids are potentially important to interpret complex biological processes resulted from cell-substrate interactions. When a droplet sits on a soft surface, its surface tension deforms the contact line, creating a “wetting ridge,” which causes characteristic spreading behaviors. The key to understand the underlying mechanisms is to investigate wetting ridge dynamics during spreading. However, it is challenging to explore wetting ridge dynamics, mostly due to limitations in observation. Here, we directly visualize wetting ridges in real-time during spreading using x-ray microscopy with a high spatio-temporal resolution. We reveal that the growth of wetting ridges is dominated by their broadening in early stage and by their heightening in later stage. The two growth mechanisms control the ridge-geometry and determine the spreading behaviors. Most importantly, we find that the contact line pinning is enhanced by increased flexibility of the ridge cusp. Finally, we clarify two different mechanisms of pinning/depinning transitions: “stick-slipping” and “stick-breaking.”

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