
Wrinkling of thin sheets on a rotating cylinder

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Abstract

Wrinkles are around us, not only on the skin of humans and animals but also in industrial applications, such as wearable devices and stretchable electronics. The mechanism of wrinkling instability has been extensively studied in several boundary conditions: swelling, elastic foundations, or curved substrate. Still, the wrinkling of stretched sheets on a rigid cylinder has not been less investigated so far. We perform systematic experiments for the stretched sheet on a rotating cylinder. The elastomeric sheet suspended and stretched by weight is attached to the cylinder which rotates at a constant speed. We find that the wrinkles appear and propagate along the cylinder, depending on the sheet aspect ratio and loading conditions. In parallel with the rotating experiments, we consider the shape of the suspended sheet under the same loading condition, combining experiments and finite element simulations, which will help the understanding the wrinkling on the rotating cylinder. Our findings will be applied to predict and control wrinkling, which appears as an obstacle in wearable devices.

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