

The frustrating tearing of adhesive films

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Thin adhesive films have become increasingly important in applications involving packaging, coating, or for advertising. Once a film is adhered to a substrate, flaps can be detached by tearing and peeling, but they narrow and collapse in pointy shapes. Similar geometries are observed when peeling ultrathin films grown or deposited on a solid substrate, or skinning the natural protective cover of a ripe fruit.

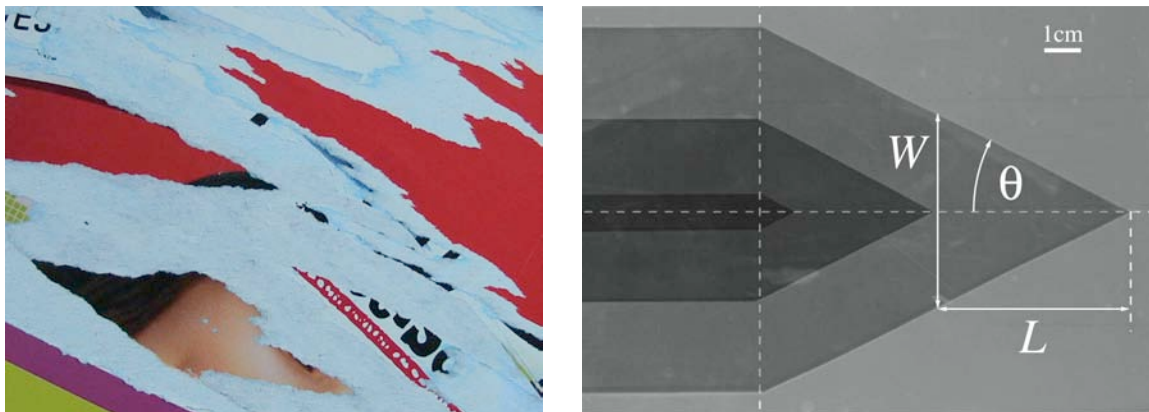


Figure 1. Left : Torn poster exhibit pointy shapes. Only parts of the poster is removed each time. Right : In a controlled experiment using homogeneous material, when pulling strips from initial cut with different width, one obtains triangular shape with the same angle θ .

Here we show that the detached flaps have perfect triangular shapes with a well defined vertex angle θ ; this is a signature of the conversion of bending energy into surface energy of fracture and adhesion. In particular, this triangular shape of the tear encodes the mechanical parameters related to these three forms of energy and could form the basis of a quantitative assay [1] for the mechanical characterization of thin adhesive films, nanofilms deposited on substrates, or fruit skin.

1. Hamm E., Reis P.M., Leblanc M., Roman B., Cerda E. (2008) *Nature Materials* 7, 5. 386-390