ABSTRACT:

Opening the thin packaging film of packets of biscuits or CD cases has never been easy, especially if one lacks a sharp knife. One way out is to use a key or a pen. If we use such a blunter object to tear open the plastic, the resulting crack follows a remarkably well defined and highly reproducible oscillatory path, rather than being straight. We have built a well controlled experiment to study this phenomena. Moreover, we have developed a geometrical 2D model based on the coupling of thin sheets elasticity with fracture theory, which yields results in excellent agreement with the experiments. We have also uncovered two novel straight-to-oscillatory (Unzip) instabilities in this system as the angle of the cutting tool (with respect to the horizontal) or the speed of cutting are varied. The latter is a compelling example of a ductile-to-brittle transition. Finally, we briefly present some open problems of coupling thin sheets elasticity with other phenomena: pealing, localization in solid foams, delimitation from adhesive substrates and fluid flow.