

Abstract Submitted  
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**Popping balloons: formation of a crack network in rubber membranes** SEBASTIEN MOULINET, MOKHTAR ADDA-BEDIA, Lab. de Physique Statistique, EQUIPE MORPHOGENÈSE ET PHÉNOMÈNES MULTI-ÉCHELLE TEAM — Everyone can make the observation: a rubber balloon inflated until it spontaneously pop breaks into a large number of shreds. In contrast, a balloon pierced with a needle at an early stage of its inflation breaks into two large pieces. Using model latex balloons, we have experimentally investigated the transition between these two breaking regimes. We have showed that, above a threshold stress in the latex membrane, a single crack become unstable and separates into two new cracks. Then, a cascade of tip-splitting generates a network of cracks that eventually form a large number of fragments. We have observed that the instability of the crack occurs when it reaches a limit velocity that could the speed of sound. By studying the energy balance during the explosion, we can determine the intrinsic fracture energy of rubber, a measurement difficult to achieve with usual tensile testing.

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