Dynamics of Hollow Elliptical Cylinder Arrays

Waverly Harden, Class of 2019

Strain-softening materials have gained significant interest in the physics, mathematics and material science communities recently. Most materials we are familiar with are strain-hardening, meaning as they deform, they become harder to deform. Strain-softening materials have the opposite property; as they deform, they become easier to deform. The dynamics of strain-softening materials in an experimental setting have been rarely studied. I have been working on modeling and simulating a system that exhibits such strain-softening behavior. It consists of a chain of hollow elliptical cylinders (HEC). An initial force on the first particle of the chain puts a dispersive shock wave in motion. A dispersive shock wave through strain-softening material has a peak that propagates slower than the rest of the wave, causing it to eventually disperse. The point at which the wave breaks causes sudden changes in its surrounding atmosphere and can be very damaging. Thus, mathematically modeling this break lp prtp11(g)C P MCID 56>DC 1B1 06ak ,s2r0 0 1 116.78 533.8 Tf 0 MCID 56>DC 1B1 DC 3(lp pr)4(tp11