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Impact of solid and liquids balls on a solid surface: a unified description[1] CHRISTIAN LIGOURE, SRISHTI ARORA, JEAN-MARC FROMENTAL, L2C UMR 5221 CNRS University of Montpellier, SERGE MORA, LMGC UMR 5508 CNRS University of Montpellier, TY PHOU, LAURENCE RAMOS, L2C UMR 5221 CNRS University of Montpellier — We study experimentally the impact of ultra soft spherical gel balls of millimetric size $d_0$on a rigid substrate covered by a thin layer of liquid nitrogen to avoid viscous dissipation .The balls largely deform like a pancake at high impact velocities. We measure the maximally deformed size d_{max} and the the time needed to reach this maximal size after impact τ_{max}, versus the impact velocity u_i for various elastic moduli . We do the same type of experiments with liquid droplets of various surface tensions . The experiments reveal a universal scaling behavior of the maximum deformation $\dot{max}/d_0$ of both solid balls and liquid drops provided that both bulk and surface elasticity are properly taken into account. Moreover, we show that , in absence of viscous dissipation, the dynamics of the system can be understood as a conventional spring-mass system with a stiffness given by a combination of surface tension and bulk elasticity and a mass given by that of the ball (or drop) ; the deformation of the small ball (drop) during the impact linearly depends on the impact velocity, and the contact time scales as the period of this spring-mass system.

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