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A Different Cone: Bursting Drops in Solids XUANHE ZHAO, Duke University — Drops in fluids tend to be spheres—a shape that minimizes surface energy. In thunderstorm clouds, drops can become unstable and emit thin jets when charged beyond certain limits. The instability of electrified drops in gases and liquids has been widely studied and used in applications including ink-jet printing, electrospinning nano-fibers, microfluidics and electrospray ionization. Here we report a different scenario: drops in solids become unstable and burst under sufficiently high electric fields. We find the instability of drops in solids morphologically resembles that in liquids, but the critical electric field for the instability follows a different scaling due to elasticity of solids. Our observations and theoretical models not only advance the fundamental understanding of electrified drops but also suggest a new failure mechanism of high-energy-density dielectric polymers, which have diverse applications ranging from capacitors for power grids and electric vehicles to muscle-like transducers for soft robots and energy harvesting.

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