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Explosive Leidenfrost droplets[1] PIERRE COLINET, Université Libre de Bruxelles, FLORIAN MOREAU, Ecole nationale supérieure de mécanique et d'aérotechnique, STÉPHANE DORBOLO, Université de Liège — We show that Leidenfrost droplets made of an aqueous solution of surfactant undergo a violent explosion in a wide range of initial volumes and concentrations. This unexpected behavior turns out to be triggered by the formation of a gel-like shell, followed by a sharp temperature increase. Comparing a simple model of the radial surfactant distribution inside a spherical droplet with experiments allows highlighting the existence of a critical surface concentration for the shell to form. The temperature rise (attributed to boiling point elevation with surface concentration) is a key feature leading to the explosion, instead of the implosion (buckling) scenario reported by other authors. Indeed, under some conditions, this temperature increase is shown to be sufficient to trigger nucleation and growth of vapor bubbles in the highly superheated liquid bulk, stretching the surrounding elastic shell up to its rupture limit. The successive timescales characterizing this explosion sequence are also discussed.

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