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Explosive boiling incipience on a thin wire JEAN–CHARLES NARDIN, CÉDRIC POULAIN, CEA Grenoble, JÉRÔME DUPLAT, Universite de Provence — When a metastable liquid is superheated above its saturation temperature, a phase transition occurs via a nucleation process leading to the creation of at least one vapor bubble that grows rapidly. If the surrounding liquid is subcooled, the bubble will eventually undergo a violent collapse. A further characterization of the thermodynamic properties of this explosive phase change, (temperature at the onset of nucleation as well as pressure inside the first nuclei), together with the following bubble dynamics, is necessary for a better comprehension of boiling phenomena. Thanks to dedicated experiments in which a platinum micrometer–size wire is heated in a liquid at ambient pressure and temperature, we will report that the onset temperature is close to the spinodal temperature but slightly depends on the heating rate. Using high–speed video imaging of the bubble dynamics together with the Rayleigh–Plesset equation, we will show how the heating rate, as well as the heater size governs the nucleation process (bubble lifetime, maximum radius reached, expansion velocity and cooling of the wire at the onset).

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