

Abstract Submitted
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Observation of Superheating and Single Bubble Nucleation in Thin, Solid State Nanopores GAKU NAGASHIMA, EDLYN LEVINE, DAVID HOOGERHEIDE, Harvard, MICHAEL BURNS, Rowland Institute at Harvard, JENE GOLOVCHENKO, Harvard — We demonstrate localized and extreme superheating, and homogeneous single bubble nucleation in a nanopore in a thin silicon nitride membrane immersed in an electrolyte solution. The high temperatures are achieved by Joule heating from a highly focused ionic current induced to flow through the pore by a modest voltage bias applied across the membrane. The superheating of the electrolyte is observed by monitoring a change in electrical conductance of the system which increases with temperature. The high temperatures can lead to transient explosive vapor bubble nucleation in the pore. The nucleation event is detected both electronically and optically. The bubble nucleation event is highly deterministic and reproducible. Optical transmission experiments indicate that the bubble nucleation is homogeneous, occurring near the pore center. These phenomena have been observed in pores down to 60 nm in radius.

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