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Transient thermal driven bubble's surface and its potential ultrasound-induced damage[1] POOYA MOVAHED, JONATHAN B. FREUND, Univ of Illinois - Urbana — Ultrasound-induced bubble activity in soft tissues is well-known to be a potential injury mechanism in therapeutic ultrasound treatments. We consider damage by transient thermal effects, including a hypothetical mechanism based on transient thermal phenomena, including viscous dissipation. A spherically symmetric compressible Navier-Stokes discretization is developed to solve the full governing equations, both inside and outside of the bubble, without the usual simplifications in the Rayleigh-Plesset bubble dynamics approach. Equations are solved in the Lagrangian framework, which provides a sharp and accurate representation of the interface as well as the viscous dissipation and thermal transport effects, which preclude reduction to the usual Rayleigh-Plesset ordinary differential equation. This method is used to study transient thermal effects at different frequencies and pressure amplitudes relevant to therapeutic ultrasound treatments. High temperatures achieved in the surrounding medium during the violent bubble collapse phase due to the viscous dissipation in the surrounding medium and thermal conduction from the bubble are expected to cause damage.

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