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Nucleation and growth of bubbles using smooth interface models

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Modelling the nucleation and the growth of bubbles in a dense fluid is a difficult task due to the complex coupling between thermodynamics (nucleation) fluid mechanics (growth and detachment) and thermal transport. Moreover the numerical solution of such problem is usually difficult due to its free-boundary nature. Quite recently Phase-Field approaches based on smooth interface models have been used to tackle this last difficulty, allowing bubbles to be nucleated, to grow, collapse or coalesce spontaneously. We present here such a model coupling thermodynamics, fluid mechanics and thermal transport applied to the problem of heterogeneous nucleation of bubbles and growth in various thermal or pressure conditions.