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The Equation of State (EOS) of a Solid or Liquid Containing Bubbles WILHELM WOLFER, DAVID REISMAN, ROGER MINICH, Lawrence Livermore National Laboratory — We consider materials which contain dispersions of other phases or other materials in the form of fluid bubbles, and assume that the EOS are known separately for each of the phases. We derive an effective EOS of the composite or inhomogeneous material in terms of the equations of state of the phases or materials present, and in terms of their spatial distributions. However, we show that it is not sufficient to be in possession of only the equations of states for the different phases. One also needs to know the pressure and temperature dependences of all the elastic constants of the different phases. This problem is similar to determining the effective elastic moduli of a composite material. Numerical results are presented for Pd and Ni with a dispersed second phase in the form of helium bubbles or void with a volume fraction of S. We have implemented this effective equation of state in a hydrocode, and specifically analyzed a magnetically driven isentropic compression experiment (ICE) for samples having bubble volume fractions ranging from 0-3%. We find that using the Z machine ICE drive we can easily distinguish between samples that have bubble fractions of a few per cent and obtain their compression isentropes.

Wilhelm Wolfer
Lawrence Livermore National Laboratory

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