Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Propagation of Pressure Waves, Caused by a Thermal Shock, in Liquid Metals Containing Gas Bubbles KOHEI OKITA, SHU TAKAGI, YOICHIRO MATSUMOTO, Department of Mechanical Engineering, The University of Tokyo — Propagation of pressure waves caused by a thermal shock in liquid metals containing gas bubbles was investigated numerically, to examine the influences of bubble radius and void fraction on the absorption of thermal expansion of liquid metals and attenuation of the pressure waves. The present approach is to solve the mass, momentum and energy conservation equations with the equation of state for liquid metals. To consider the thermal damping effect for bubble oscillation, the mass, momentum and energy conservation equations for gas inside each bubble are solved with the Keller equation of bubble dynamics. As the result of the calculation, since the large bubbles have a lower natural frequency than the small bubbles, the peak pressure at the heated region increases with increasing bubble radius. Especially, when the bubble radii are quite large, the calculation reproduces that the pressure wave propagates through the mixture not at the sound speed of the mixture but at that of liquid mercury. On the other hand, in the condition of low void fraction, in which bubbles oscillate nonlinearly and the collapse of bubble cloud causes the high pressure rise, the pressure waves are attenuated by the thermal damping effect of bubbles.

Kohei Okita
Department of Mechanical Engineering, The University of Tokyo

Date submitted: 02 Aug 2005 Electronic form version 1.4