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The preheating effect on the dynamic strength of aluminum containing helium bubbles BENNY GLAM, Soreq NRC, Yavne 81800, Israel, MOSHE STRAUSS, NRC Negev, Beer-Sheva 9001 Israel, SHALOM ELIEZER, DANIEL MORENO, Soreq NRC, Yavne 81800, Israel — The influence of helium bubbles or boron inclusions in an aluminum target is studied by plane impact experiments with a gas gun and VISAR diagnostic. The experiments were done for targets with initial temperatures of 25 °C and near melting at 600 °C. The Hugoniot elastic limit y_{HEL} for all targets becomes substantially higher at 600 °C, related to the phonon drag mechanism at high strain rates and high temperatures. The y_{HEL} and the elastic strain rate of the preheated samples with helium are lower than these without helium, therefore it is suggested that the helium is slowing down the mobile dislocation velocity. The spall strength for all targets becomes substantially lower at 600 °C. The spall strength of Al-^{10}B with helium bubbles is significantly reduced in comparison to Al-^{10}B without helium, while at 25 °C the spall strength is the same for both cases. The experiments are analyzed by using a one dimensional hydrodynamic simulation coupled to a spall model. The model applies an inertial Rayleigh type equation of motion for the void expansion with a viscosity term presenting the high strain rate plastic flow. The simulation results indicate that at room temperature the growing voids around boron inclusions are causing the spallation while the spall in the preheated target with helium is dominated by growing helium bubbles.

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