

Ablation of metal heated through transparent media

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Action of ultrashort (subps, ps) laser pulse through transparent liquid onto absorbing metal is considered. We use one dimensional two-temperature (2T) hydrodynamics and molecular dynamics to follow evolution of contact boundary separating metal and transparent liquid. Five subsequent studies described are as follows: (i) two-temperature stage lasting few ps; (ii) decay of pressure “jump” between liquid and metal. The decay sharply accelerates contact and produces a shock in liquid and a rarefaction wave in metal; (iii) creation of a heat affected zone (HAZ) during the 2T stage; (iv) multiple nucleation in rather thick zone inside the HAZ and in the tail of rarefaction due to stretching and weakening of cohesive bonds as a result of heating; (v) deceleration of the spallation plate (SP) by inertia of liquid. Thus, on the one hand, the SP is decelerated by displaced liquid volume and on the other hand, the SP is pushed ahead by the flow of the pieces of expanded foam coming to SP from its back (relative to the contact) side.

Histories of pressure, temperature and other parameters are presented.

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