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Interaction between shock front and free surface HAIBO HU, JIDONG YU, LUOXIA CAO, YONGTAO CHEN, GUIJI WANG, GANG WU, Laboratory for Shock Wave and Detonation Physics Research, Institute of Fluid Physics, CAEP, Mianyang, China, MEIZHEN XIANG, JUN CHEN, Institute of Applied Physics and Computational Mathematics, Beijing, China, MANLING SUI, ZHENXI GUO, BO XIAO, Institute of Microstructure and Property of Advanced Materials, Beijing University of Technology, Beijing, China — The interaction of shock front with the free surface and its influence on the formation of heterogeneous phase transition percentage distribution in the near surface region is studied in a serial of experiments. The specimen of Φ8mmx0.8mm, Φ8mmx0.6mm pure iron is impacted by magnetically-driven copper flyer to create shock wave with steady amplitude of 5GPa-80GPa and shock front rising time of 10^0 ns -10^2 ns. The velocity profile of shock wave bearing the phase transition characteristics and release wave information is measured on free surface. The recovery specimen is given to metallographic analysis to reveal the ever happened dynamic phase transition percentage of iron in the near surface region. It is predicted by the phase field simulation that a near free surface layer of several μm thickness without phase transition will remain independently on the loading intensity and shock front duration in iron while the results of the MD simulation indict extra strong dependence of temperature on shock front duration in near free surface layer.

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