In situ observation of Rayleigh–Taylor instability growth of liquid Fe-Si using laser shock

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Rayleigh–Taylor instability occurs at the interface between two fluids with different densities when a heavy fluid overlies a light one in a gravitational field. The RT instability is considered as one of the important core formation mechanism beneath the magma ocean. This mechanism has been discussed from simulations (e.g., Honda et al. 1993, Ricard et al. 2009) and analog experiment (e.g., Olson and Weeraratne, 2008). However, experimental approach using liquid Fe-alloys for this mechanism has never been performed under high pressure. In this study, we applied the laser-shock technique to observe *in situ* the Rayleigh–Taylor instability of liquid Fe-Si alloy under high pressure. The growth of the Rayleigh–Taylor instability was successfully observed using *in situ* x-ray radiography under shock compression. The growth rate of the Rayleigh–Taylor instability was estimated to 0.3 ns^{-1}. The present results provide useful information to constrain the time scale of the Earth’ s and planetary core formation.

Keywords: Core formation, Rayleigh–Taylor instability, liquid Fe-alloy

