Interaction of a highly radiative shock with a solid obstacle

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Radiative shocks (RS) are phenomenon widely observed in astrophysics, for example in supernovae remnants or accretion jets. In this poster, we present experimental results obtained on highly radiative shocks generated in a low-density gas filled cell obtained on the GEKKO XII laser facility. The RS was generated by using an ablator-pusher target (CH/Sn or CH/Au/Ti), designed to limit as much as possible the preheating produced by the hot corona. The propagation media is Xe or He gas, with the aim to compare radiative effect in each medium. High velocity RS have been generated (100-140 km/s). Both self-emission and visible probe diagnostics highlighted a strong emission in the shock and an electron density in the downstream gas due to a radiative precursor. The RS characteristics which depend on the initial conditions are described here as well as its precursor interaction with an aluminum foil or a balloon in order to be closer to the astrophysical case. The obtained results show a strong extension of the radiative precursor leading to an expansion velocity of the obstacle up to 20 km/s. We also analyzed the influence of the propagation media on the shock velocity, as the propagation media is directly related to radiative effects. It seems here that we managed to reach a regime where the radiative pressure is not negligible in comparison with the thermal pressure, leading to a modification of the hydrodynamics equation. All these observations are highlighted by numerical simulations with a 2D radiative hydrodynamics code FLASH developed at the University of Chicago.

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