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Thermal Convection on an Ablating Target[1] IGBAL MEHMEDAGIC, U. S. Army, ARDEC, Picatinny Arsenal, NJ, SIVA THANGAM, Stevens Institute of Technology, NJ — Modeling and analysis of thermal convection of a metallic targets subject to radiative flux is of relevance to various manufacturing processes as well as for the development of protective shields. The present work involves the computational modeling of metallic targets subject to high heat fluxes that are both steady and pulsed. Modeling of the ablation and associated fluid dynamics when metallic surfaces are exposed to high intensity pulsed laser fluence at normal atmospheric conditions is considered. The incident energy from the laser is partly absorbed and partly reflected by the surface during ablation and subsequent vaporization of the convecting melt also participates in the radiative exchange. The energy distribution during the process between the bulk and vapor phase strongly depends on optical and thermodynamic properties of the irradiated material, radiation wavelength, and laser pulse intensity and duration. Computational findings based on effective representation and prediction of the heat transfer, melting and vaporization of the targeting material as well as plume formation and expansion are presented and discussed in the context of various ablation mechanisms, variable thermo-physical and optical properties, plume expansion and surface geometry.

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