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Dynamic response of laser ablative shock waves from coated and uncoated amorphous Boron nanoparticles[1] PREM KIRAN PATURI, LEELA CHELIKANI[2], VENKATESHWARLU PINNOJU, ACRHEM, University of Hyderabad, PANKAJ VERMA, RAJA V SINGH, High Energy Materials Research Laboratory, Sutarwadi, Pune, India, ACRHEM COLLABORATION, HEMRL COLLABORATION — Nanoparticles (NP) improve the performance of solid rocket motors with increased burning rate and lower ignition threshold owing to their larger surface area. We present spatio-temporal evolution of laser ablative shock waves (LASWs) from compacted amorphous Boron (B) and Lithium Fluoride coated Boron (LiF-B) of 70-110nm sizes that were compacted to form pellets. Thickness of the LiF coating is 5.5 ± 1nm in LiF-B. Laser pulses from second harmonic of Nd:YAG laser (532nm, 7ns) are used to generate LASWs expanding in ambient air. The precise time of energy release from the pellets under extreme ablative pressures is studied using shadowgraphy with a temporal resolution of 1.5 ns. Different nature of the shock front (SF) following Sedov-Taylor theory, before and after detachment, indicated two specific time dependent stages of energy release. From the position of SF, velocity behind the SF, similar to that of exhaust velocity is measured. Specific impulse of 241 ± 5 and 201 ± 4 sec for LiF-B and B, respectively, at a delay of 0.8μs from shock inducing laser pulse makes them potential candidates for laser based micro thruster applications.

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