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Exploring a Detonation Nature of Mesoscopic Perturbations and Ejecta Formation from the Mesoscale Probing of the PBX-driven Liners[1]

IGOR PLAKSIN, University of Coimbra, ADAI/LEDAP, RAAFAT GUIRUIS, NSWC-IH, LUIS RODRIGUES, RICARDO MENDES, University of Coimbra, ADAI/LEDAP, SVYATOSLAV PLAKSIN, EDUARDO FERNANDES, CLAUDIA FERREIRA, University of Coimbra, ADAI — Ejecting debris from free surface of liner is of considerable interest at optimization of explosive devices, in which the PBX-driven liner effects shock compression of gaseous matter. Following factors were historically considered as main drivers of material ejection: granular microstructure of liner material, roughness and surface defects of liner, and shock pressure time history in PBX-driven liner. In contrast to existing models, we are considering the small scale fluctuations of detonation flow as probable dominating factor of surface jetting in the PBX-driven collapsing liners. Obtained experimental evidence is indicative that jetting from the liners is caused by meso-scale perturbations of PBX detonations, which are identified as (1) ejecta of overdriven detonation products through detonation front, (2) ejecta-driven detonation cells, and (3) galloping detonation front motion. Spatially resolved scenarios of each of phenomena (1-3) were obtained in experiments with copper-liners and HMX-based PBXs fabricated on maximum packing density of crystalline constituents. Both the DRZ-induced perturbations translated to a PBX-driven liner and the ejected debris were recorded and quantitatively measured in the mesoscale range with application of the 96-channel optical analyzer MCOA-UC.

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Igor Plaksin
University of Coimbra, ADAI/LEDAP

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