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Development of Low-Density Explosive Formulations Based on Ammonium Picrate with Slow Detonation Velocities BRYCE TAPPAN, JOHN BUDZINSKI, ERIC MAS, LARRY HULL, LARRY HILL, PATRICK BOWDEN, JOSEPH LICHTHARDT, ANDREW SCHMALZER, MARVIN SHORTY, PHILIP MILLER, DANIEL MCDONALD, MICHAEL BURKETT, Los Alamos National Laboratory — Traditional slow Dv explosive components, such as Baratol (76% Ba(NO3)2 and 24% TNT), rely on dilution of a traditional explosive with a dense relatively inert material, while some utilize Ca(NO3)2, ZnO or BaCO3. However, our applications require solely CHNO-based formulations that exhibit slow Dv near theoretical maximum density. Given a target Dv of 6.5 mm/s, ammonium picrate was chosen as a convenient explosive to be diluted with a high binder level (14-20%). Thermal equilibrium calculations were performed to determine the binder level to provide the desired Dv. Two formulations were produced, a molding powder with a polystyrene/dioctyl adipate binder, Dv = 6.45 mm/s and a cast-cure using hydroxy-terminated polybutadiene/bis-(2,2-dinitropropyl)acetal-formal/MDI binder (AmPicCC), Dv = 6.58 mm/s. All formulations showed no sensitivity response or compatibility issues. The AmPicCC was chosen for further analysis, and cylinder expansion was performed followed by JWL parameterization. AmPicCC was found to initiate and propagate unconfined at thicknesses above 12 mm. The ultimate test configuration of the formulation is discussed with a sweeping initiation from PBX 9502 imaged with proton radiography (pRad) to visualize the lagging AmPicCC detonation front, as predicted by simulation.

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