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Post-Detonation Energy Release from TNT-Aluminum Explosives FAN ZHANG, JOHN ANDERSON, AKIO YOSHINAKA, DRDC Suffield, Canada — Detonation and post-detonation energy release from TNT and TNT-aluminum composite have been experimentally studied in an air-filled chamber, 26 m^3 in volume and 3 m in diameter. While TNT has a high oxygen deficiency, experiments with 1.1 kg to 4 kg charges yield energy releases reaching only 86% of theoretical equilibrium values, possibly due to the non-uniform mixing between the detonation products and air. In order to improve mixing and further increase afterburning energy, large mass fractions of large aluminum particles are combined with TNT. The effect of particle distribution is also investigated in two composite configurations, whereby the aluminum particles are uniformly mixed in cast TNT or arranged in a shell surrounding a TNT cylinder. It is shown that the TNT-aluminum composite outperforms pure TNT, while improved performance is achieved for the shell configuration due to enhanced spatial mixing of hot fuels with oxidizing gases. Comparisons with the equilibrium theory and a liquid-based aluminized composite explosive (with an oxygen deficiency less than that of TNT) are conducted to further explore the mixing and afterburning mechanism.

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