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Recent Advances on Thermal Safety Characterization of Energetic Materials PETER HSU, STEVE STROUT, MICHA GRESSHOFF, EVAN KAHL, GREG KLUNDER, Lawrence Livermore National Laboratory — Understanding the response of energetic material to thermal insults is very important for the storage and handling of energetic materials. The One-Dimensional Time to Explosion (ODTX) system at the Lawrence Livermore National Laboratory (LLNL) has been used for decades to characterize the thermal sensitivity of energetic materials and provide data for the construction of cook-off models. The system can measure times to explosion, the threshold temperature for thermal explosion and allow for the determination of kinetic parameters. In 2014, we added pressure diagnostics to the system, referred as P-ODTX. When energetic material is heated in a confined space, pressure increases slowly at low temperature. As the temperature increases, thermal decomposition accelerates resulting in higher gas pressure until thermal explosion occurs, at which time gas pressure increases very rapidly. In 2016 the data acquisition system was upgraded to allows for gas pressure measurement in micro-second intervals during thermal explosion. In this paper, we will share our recent times to explosion data on various energetic materials as well as gas pressure data during thermal explosion. We will also report recent progress in our C-ODTX development for the in-situ measurement of gas composition at elevated temperature and pressure as explosive is heated in a confined space.

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