

Heat flow calorimetry of unstabilized nitrocellulose powders and pressed pellets

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The stability of pure nitrocellulose samples has been investigated by heat flow calorimetry in order to be able to distinguish between different nitrocellulose sources. Usually the purpose of stability measurements is to approve or disapprove the (prolonged) storage of nitrocellulose based propellants. The latter application is product specific. Here the nitrocellulose as a basic ingredient of propellants is investigated.

Two different qualities of nitrocellulose are tested with a systematic variation in sample and heat flow calorimetry conditions. The nitrocellulose samples are tested at 75 and 85 °C in a stainless steel cell with a 70 ml internal volume. The samples are tested as powder or as pressed pellets, and the sample weight is 3 or 5 gram. Also duplicate measurements are performed. The initial lack of reproducibility between experiments is solved by paying attention to orientation of the pressed pellets when put in the calorimetry cell, i.e. at random, standing or prone. The experiments then become clearly reproducible when presented in a graph of heat production versus time, and for times up to the onset of a runaway.

The experiments with nitrocellulose samples of two different sources demonstrate 1) the accuracy of the heat flow calorimetry technique, 2) the importance of pellet orientation and 3) the possibility to distinguish between nitrocellulose qualities of different sources as ingredient for propellant formulations.

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