

Innovative pyrotechnics

The know-how on pyrotechnics in combination with the most modern test facilities makes TNO a dedicated partner for applied research, development, testing, risk assessments and classification of pyrotechnics. A broad technology basis enables an integral approach including performance, safety, environmental and economic aspects. The continuous research activities on pyrotechnics and the strong interaction with both defence and civil related developments put TNO at the highest level of know-how and technology.

Technology development

TNO is developing pyrotechnic solutions for both defence industries and for civil industries. In the defence industry, for example, we work on igniter systems for ammunition. In the civil industry one can think of applications as emergency flares, thermite reactions (e.g. welding), cable cutters, air bags, etcetera. Besides the product and process development expertise we have the capability also to assess safety and environmental aspects.

Thermite materials are attractive energetic materials because the reactions are highly exothermic, have high energy densities, and high temperatures of combustion. Such reactions are used by the metal industry. Metastable Intermolecular Composite (MIC) materials, also referred to as super-thermites, are comprised of a mixture of oxidizer and fuel with particle sizes in the



High speed recording of a burning pyrotechnic composition.

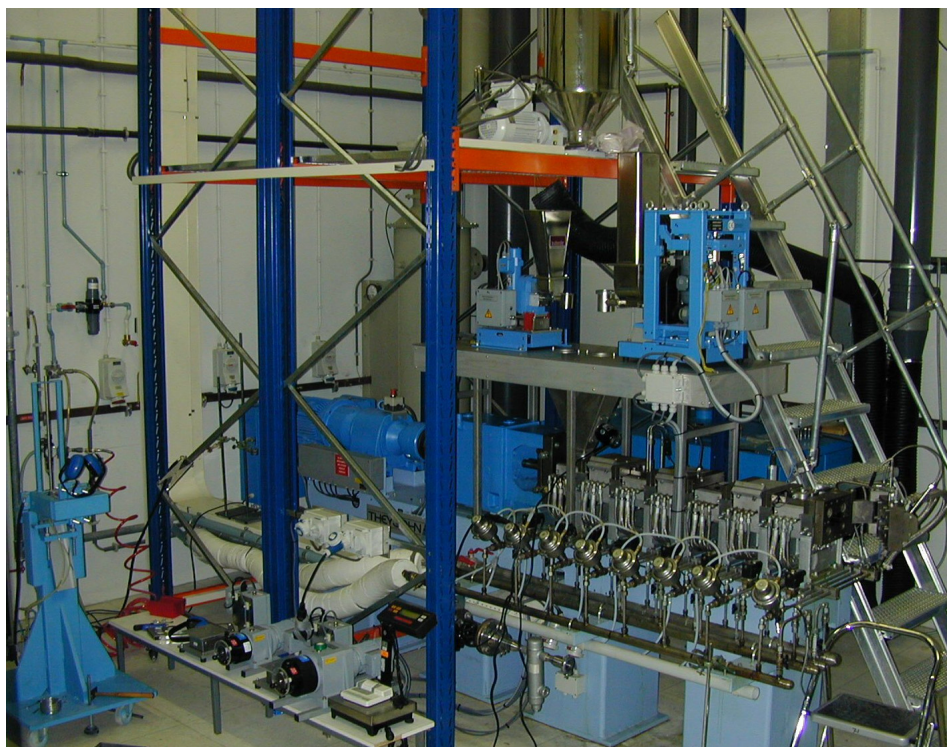
nanometer range, which enable the fast release of the energy. At TNO MICs are studied for numerous applications, like, among others, lead free matches and energetic systems. At TNO special attention is given to new formulations.

Services on innovative pyrotechnics

- Development of dedicated pyrotechnic compositions and products;
- Development of energetic processes using e.g. thermite reactions;
- Testing and classification of pyrotechnic materials and products;
- Life time assessment;
- Advice on industrial packaging and safety regulations.

Facilities

- Small-scale synthesis and crystallization (lab scale - 2 liters);
- Infrastructure for safe handling of energetic materials up to 25 kg (TNT eq);
- Characterization equipment for energetic materials and compositions (thermal, physical, chemical, mechanical, rheological, etc.);
- Fourier Transform Infrared Spectrometer (FTIR);
- Multi spectral Radiometer Transmissometer (MSRT);
- Mixing, pressing, casting and extrusion equipment for prototype production;
- Pyrotechnic testing tunnel.



Twin extruder for small scale production of pyrotechnic compositions.

Defence, Security and Safety

'TNO Defence, Security and Safety' is the title under which TNO operates as a strategic partner for the Dutch Ministry of Defence and makes innovative contributions to enhancing the security of the Netherlands both at home and abroad. We also use our accumulated knowledge for foreign governments and for defence-related industries.

R. (Rutger) Webb, B.Sc.

P +31 15 2843771

E rutger.webb@tno.nl

TNO Defence, Security and Safety

Lange Kleiweg 137

P.O. Box 45

2280 AA Rijswijk

The Netherlands

info-DenV@tno.nl

tno.nl