LA-UR 10-07487

Licensable Technologies

Insensitive Extrudable Explosive

Applications:

- Plastic and extrudable explosive replacement
- Demolition
- Seismic prospecting
- Geographical mapping
- Oil & gas industry
- Quarrying
- Mining
- Construction
- Military and law enforcement
- Flexible shaped charges
- Shock hardening
- Explosive welding
- Sheet explosives
- Detonating cord (cased or bare)

Benefits:

- Compatible with standard explosives
- Safer than current technology (i.e. insensitive to impact and other stimuli)
- Improved mechanical toughness and flexibility
- Highly extrudable
- Adhesively bonds to surfaces
- Economical
- Environmentally friendly

Contact:

Marcus A. Lucero
(505) 665-6569
marcus@lanl.gov

tmt-1@lanl.gov

Technology Transfer Division

Los Alamos NATIONAL LABORATORY ESTABLISHED 1943

Summary:

Traditional state-of-the-art extrudable explosives are relatively sensitive to friction and impact, which make them hazardous to use. Extrudable, plastic, and "plastic-bonded" explosives consist of particulate solid high explosives embedded in a polymer matrix. As such, they all rely on weak forces, such as surface tension, for adhesion between the explosive particles and binder material. This causes the explosive to have relatively weak mechanical properties, limiting potential applications. Additionally, chemical waste from conventional manufacturing processes is becoming more of a concern for many standard products.

In response to these issues, Los Alamos National Laboratory scientists have developed a novel explosive using a new class of materials in which an energetic binder is chemically attached to a particulate solid explosive using an innovative technique. This type of synthesis produces an explosive with enhanced mechanical properties that make it flexible, tough, and versatile. It is also insensitive to impact, friction, spark, and other stimuli. In addition, when these novel materials are initially mixed they form a viscous fluid that is highly extrudable. The polymerization time of these materials can be controlled over a range of minutes to hours, and is irreversible when complete. Density of the finished product may be manipulated over a significant range. Once polymerized, the material becomes a tough, flexible rubber. Mechanical and explosive properties may be tuned for specific applications. Failure diameter of the explosive is comparable and/or better than current explosives, and it may be initiated using standard detonators. Lastly, this relatively inexpensive explosive synthesis utilizes "green" reagents in aqueous media, yielding non-hazardous environmentally friendly waste.

While polymer systems chemically bonded to particulate solids have been successfully developed for other applications, we believe this is the first economical and environmentally friendly plastic-bonded explosive to employ this approach. The synthesis of this novel insensitive extrudable explosive with advanced mechanical and performance properties opens a range of possibilities previously unaccessible by using current technologies.

Development Stage: Working prototype, ready for commercial deployment

Patent Status: Patents pending

Licensing Status: Available for exclusive or non-exclusive licensing and collaborative agreements

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