ABSTRACT

Military High Explosives are the most volatile and highly energetic materials used in a variety of modern munitions such as Artillery shells, HEAT rounds and other warheads. With the growing demands of safety and security during explosives handling, transportation, storage or disposal process, it has become evident that the unserviceable or undesirable surplus munitions should be disposed-off in a safest manner. Many disposal techniques have so far been utilized for the disposal of unserviceable or unwanted explosive materials, out of which the most important is solvent -recovery of unserviceable or undesirable explosive materials. Such a method is not only safe and secure environmentally but gives monetary benefits by complete recovery and reutilization of all the explosive materials from munitions. Huge stockpiles of unserviceable munitions are held in the Ammunition Depots which can be recovered and reutilized in multiple applications such as commercial explosives, energy sector and other relevant fields. The present research work has been carried out on solvent-based separation of melt-cast explosives substances such as RDX and TNT from unserviceable Composition B explosives. Chloroform solvent in different proportion has been used to separate RDX and TNT along with Paraffin Wax from unserviceable Composition B explosive material. After the successful separation of main explosive ingredients i.e. RDX and TNT, a comprehensive study of all explosive materials in comparison to serviceable explosive substances have been carried out. Thermal behaviour and various kinetic parameters like activation energy of these explosive materials have further been measured under controlled temperature program using simultaneous TG/DTA technique. From the calculation of activation energies for various military high explosives using Horowitz and Metzger method, it has been revealed that explosive material loses its stability and sensitivity during long storage life due to moisture ingress or inadequate storage and handling conditions. Another reason may be the presence of impurities during manufacture, filling or formulations. Thus an explosive material filled in munitions with any of the above problems may lead to premature fire, toxic and possible explosion hazard.

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ABBREVIATIONS

HE	High Explosive
TNT	Trinitrotoluene
RDX	Research Department Explosive
HMX	High Melting Explosive
PETN	Pentaerythritol Tetranitrate
TG	Thermogravimetry
DTA	Differential Thermal Analysis
DTG	Derivative Thermogravimetry
DSC	Differential Scanning Calorimetry
Ea	Activation Energy
Svc	Serviceable
Unsvc	Unserviceable
M/Pt	Melting Point
SEM	Scanning Electron Microscopy
FT-IR	Fourier Transform –Infra Red
GC-MS	Gas Chromatography- Mass Spectrometry