95-1003-48

MILLENNIUM APPLICATION BRIEF

TOPIC: Analysis of High Explosives by HPLC with PDA Detection

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Introduction:

Analysis of composition C-4 (a plastic explosive), detonating cord (an initiator), and tetrytol (a shape charge explosive) was done using HPLC with PDA detection. Samples of each were extracted in acetonitrile and injected. Figure 1 is a PDA report on the C-4 sample showing the main component (RDX) as well as a smaller amount of HMX which is a by-product of the manufacturing of RDX. Peak purity and library information on the main peaks is provided as well. Figure 2 is of the tetrytol which is a mixture of tetryl and TNT. Figure 3 is of detonating cord showing the main component (PETN) as well as several explosive contaminants (RDX and TNT). HPLC with PDA detection allows for the rapid analysis of the explosive ingredients in high explosives.

Names:

RDX: 1,3,5-Trinitro-1,3,5-triazacyclohexane
HMX: 1,3,5,7-Tetranitro-1,3,5,7-tetracyclooctane
TNT: 2,4,6-Trinitrotoluene
PETN: Pentaerythritol Tetranitrate

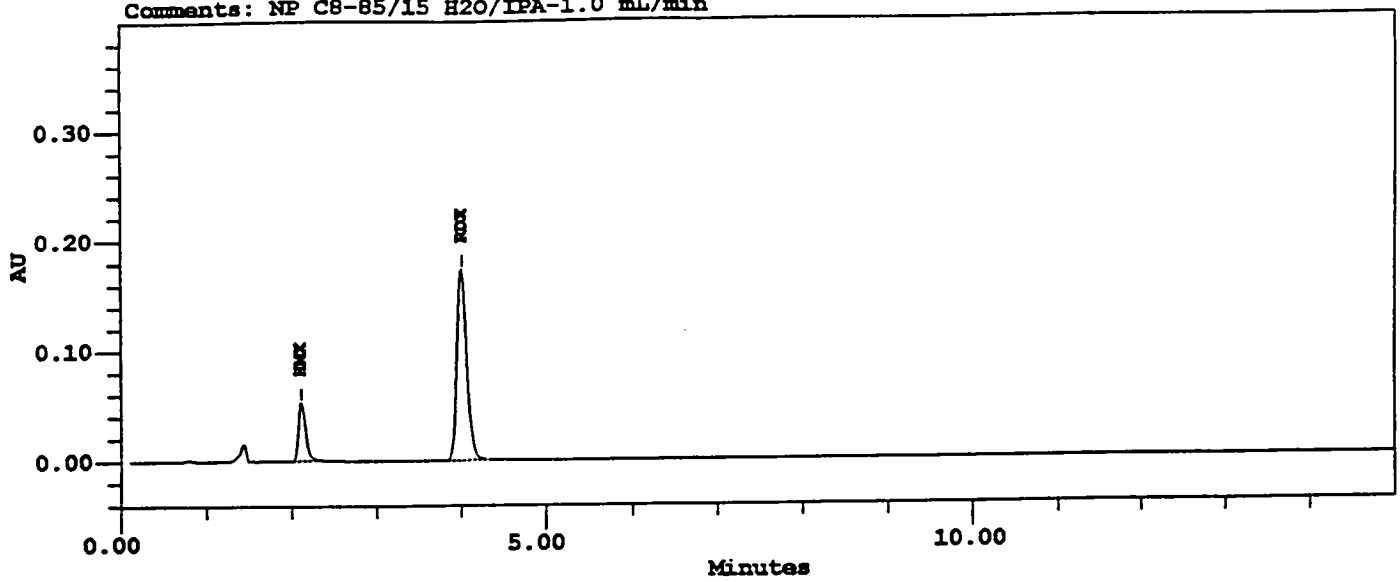
EXPERIMENTAL:
Explosive Analysis

System:	600 Pump, 717+ Autosampler, 996 PDA
Mobile Phase:	Water:Isopropanol (85/15) (isocratic)
Column:	Waters Nova-Pak C8 (3.9 X 150mm)
Flow Rate:	1.0 mL/min
Detection:	PDA collecting from 210-350nm @ 2.4 nm resolution
Data:	Millennium 2010 Chromatography Manager, Ver. 2.1

FIGURES:

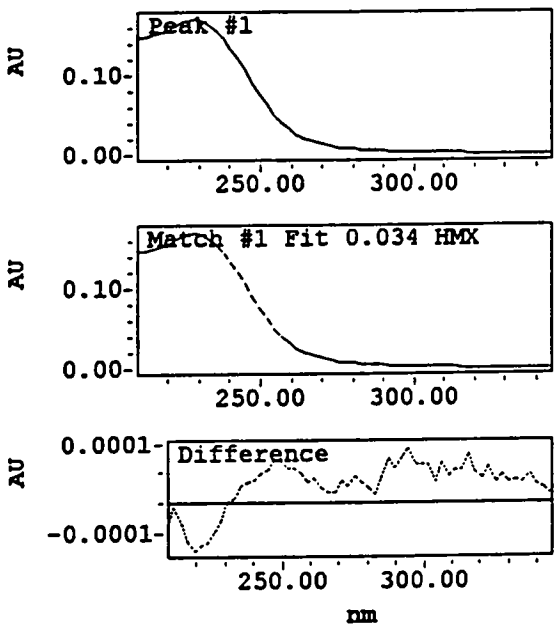
Figure 1: PDA report for composition C-4
Figure 2: PDA report for tetrytol
Figure 3: PDA report for detonating cord

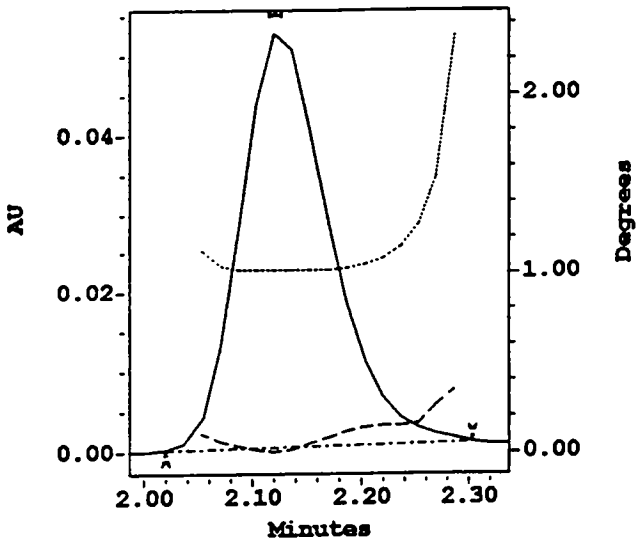
SampleName: C4 (0.1-0.3mL)(1:1)-2 uL Channel Name: 254nm
Comments: NP C8-85/15 H2O/IPA-1.0 mL/min



Peak 1: HMX RT: 2.12 Pass: 1

Match Plot Peak 1: HMX RT: 2.12



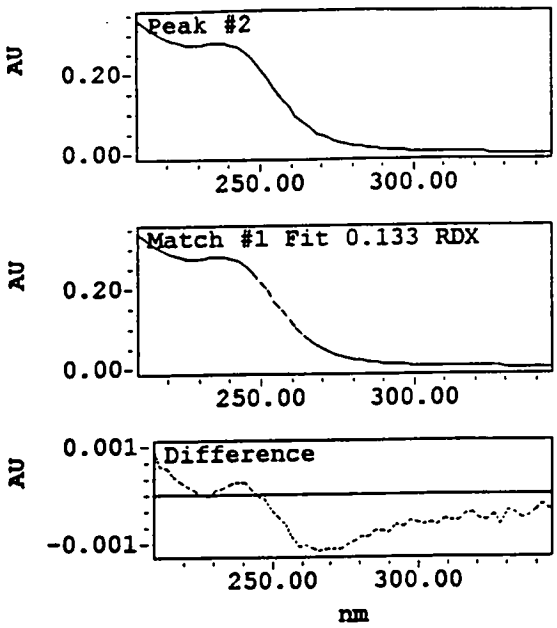


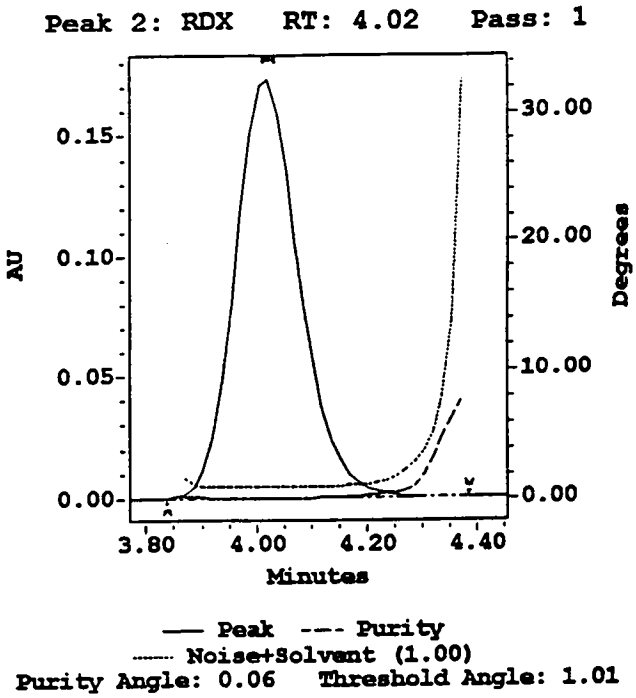
— Peak --- Purity
..... Noise+Solvent (1.00)
Purity Angle: 0.05 Threshold Angle: 1.02

Peak Purity and Match Results

#	Peak Name	Ret Time (min)	Area (uV*sec)	Purity Angle	Purity Thresh.	Purity Flag	First Match Angle	First Match Threshold	Match Flag	1st Match Spectrum Name
1	HMX	2.12	300503	0.05	1.02		0.03	1.01		HMX

Match Plot Peak 2: RDX RT: 4.02





Peak Purity and Match Results

#	Peak Name	Ret Time (min)	Area (uV*sec)	Purity Angle	Purity Thresh.	Purity Flag	First Match Angle	First Match Threshold	Match Flag	1st Match Spectrum Name
1	RDX	4.02	1417591	0.06	1.01		0.13	1.02		RDX