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ASSESSMENT OF AUSTRALIAN INSENSITIVE RDX

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Outline

- Background
- RDX samples
- Formulations
- Shock Sensitivity Results
- Conclusions

Background

SNPE

- *I*-RDX "discovered" by SNPE
- Cast-cured PBXs containing *I*-RDX are intrinsically less sensitive to shock stimuli
  - Not effective in pressed PBXs
  - Not effective in melt-cast formulations
  - Increased critical diameter in cast-cured PBXs
  - No chemical or physical differences detected
  - No difference in friction or impact sensitiveness

Background

DSTO

- LSGT data for PBXW-115 formulations
  - PBXW-115 – US. 50% point = 4.7 GPa
  - PBXW-115(Aust) – DSTO. 50% point = 6.3 GPa

G. Bocksteiner, M. G. Wolfson and D. J. Whelan, DSTO-TR-0076.

RDX Samples

1) ADI Grade A Class 1 (type I, recrystallised)

2) SNPE *I*-RDX

3) Dyno Nobel Type II Class 1

• ADI Limited – development and manufacturing of explosives, propellants and ordnance in Australia

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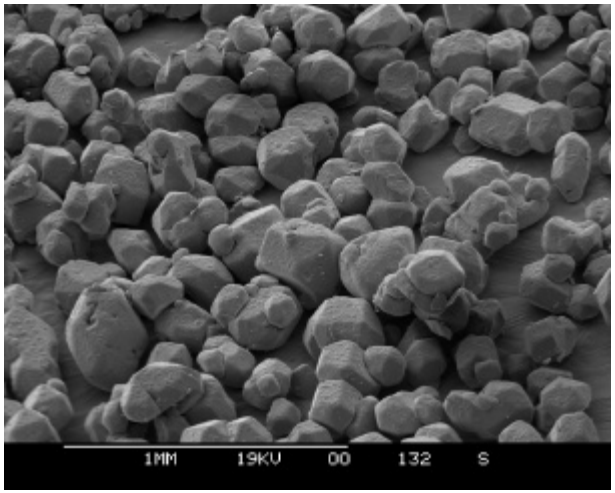
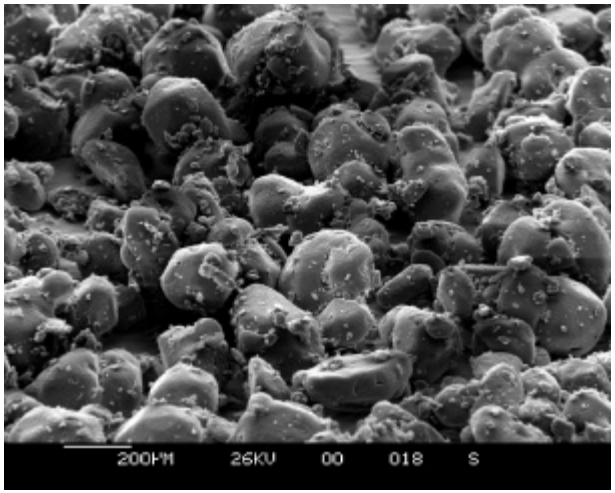
RDX Samples

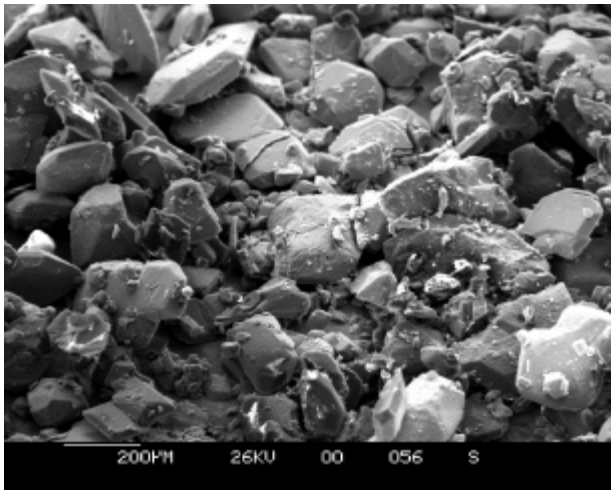
RDX	Particle Size Analysis	
	d(0.5)	Span
ADI Grade A	224	1.1
SNPE *I*-RDX	213	1.7
Dyno Type II	306	1.3



ADI



SNPE



Dyno

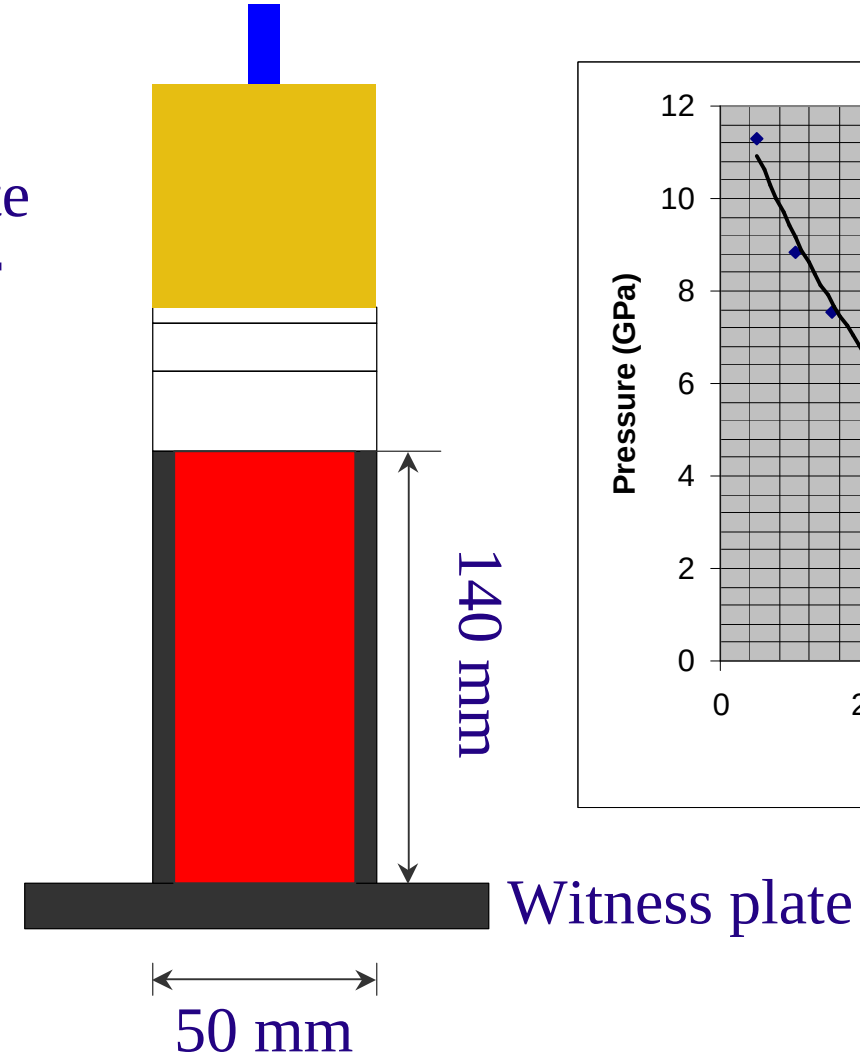
Formulations

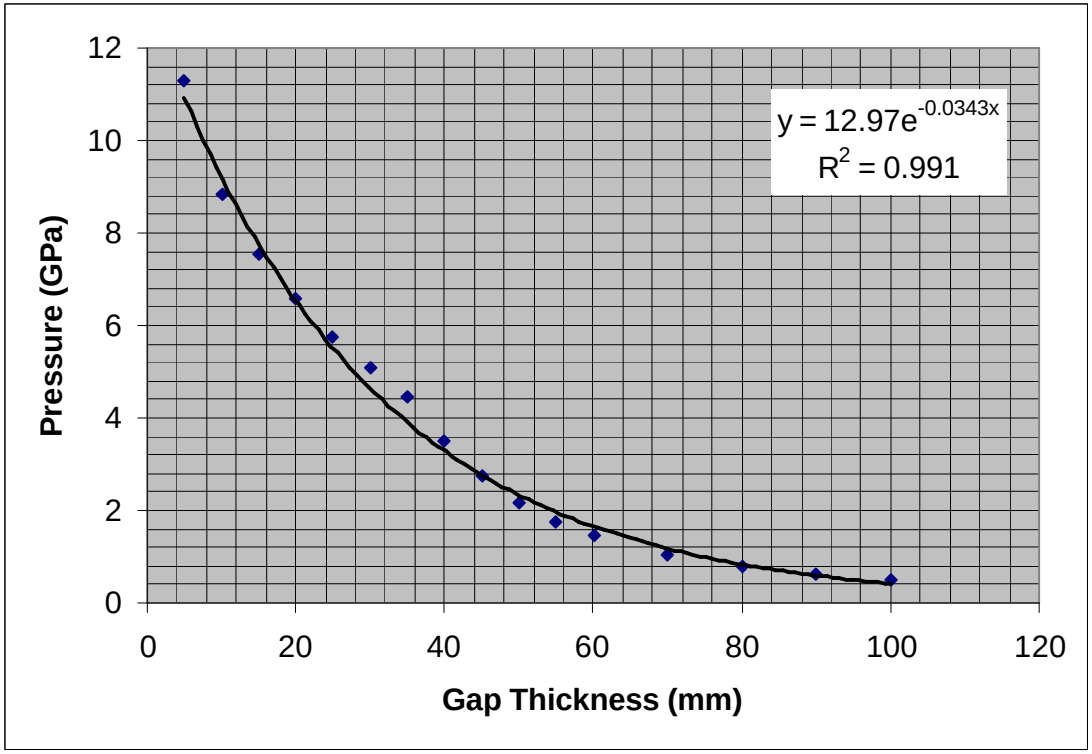
- Cast-cured PBXs
  - PBXN-109 (64% RDX, 20% aluminium, 16% binder)
  - ARX-2020 (78% RDX, 22% binder)
  - PBXW-115(Aust) (20% RDX, 43% AP, 25% Al, 12% binder)
- Melt-cast
  - RDX 60% / TNT 40% (no wax)

MRL Large Scale Gap Test

Cast Pentolite Booster

PMMA





Shock Sensitivity – PBXN-109

RDX	50% Gap	
	No. of Cards	Pressure (GPa)
ADI Grade A	109	5.0
SNPE *I*-RDX	130	5-6
CXM-7 (Dyno Type II)	196	2.4
SNPE *MI*-RDX	200	2-3
Dyno recryst. + 5% HMX	196	2.4
ADI Grade A + 5% HMX	117	4.7

SNPE data from C. Spyckerelle, L. Donnio, J. Aviles and A. Freche, 32nd ICT 2001.

Shock Sensitivity – ARX-2020

RDX	50% Gap	
	No. of Cards	Pressure (GPa)
ADI Grade A	117	4.7
SNPE *I*-RDX	123	4.5
Dyno Type II	168	3.0
ADI Grade B	171	2.9

Grade A = type I, recrystallised
Grade B = type I, boiled and milled

ARX-2020 = 78% RDX, 22% binder

Shock Sensitivity – PBXW-115

RDX	50% Point		Data Source
	No. Cards	Pressure (GPa)	
ADI Grade A	87	6.3	DSTO
SNPE *I*-RDX	84	6.3	DSTO
US Type II	130	4.7	US

Shock Sensitivity – Melt-Cast

Formulation: 60% RDX / 40% TNT (no wax)

Density: 1.70 g/cm^3

RDX	50% Point	
	No. of Cards	GPa
ADI Grade A	234	1.7
SNPE *I*-RDX	234	1.7
Dyno Type II	235	1.7

Critical Diameter

Formulation	RDX	D_{crit} (mm)
PBXN-109	CXM-7 (Dyno type II)	< 10
PBXN-109	ADI Grade A	$15 < D_{crit} < 20$
PBXN-109	SNPE *MI*-RDX	7
PBXN-109	SNPE *I*-RDX	14
PBXW-115	US Type II	38
PBXW-115 (Aust)	ADI Grade A	80

SNPE data from *S. Lecume, J. Aviles, L. Dinnio, A. Freche, C. Spyckerelle, IMEMTS 2001.*
PBXW-115 data from *G. Bocksteiner, M. G. Wolfson and D. J. Whelan, DSTO-TR-0076.*

Conclusions

- Cast-cured PBXs containing insensitive RDX grades are intrinsically less sensitive to shock stimuli and have increased critical diameters
- The use of these grades of RDX in melt-cast formulations does not affect the shock sensitivity
- Not all type I RDXs are “insensitive”
- Not all recrystallisation techniques produce insensitive RDX
- **ADI Grade A RDX is an insensitive RDX**

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Other Research

Sympathetic Reaction Trials

Acknowledgements

- Max Joyner, Bob Arbon and John Symes
- Proof & Experimental Establishment Pt Wakefield
- ADI Limited

QUESTIONS?