

Retrieval of Thermally Stressed Nitramine (RDX, HMX) Charges

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Acknowledgements

- Input material & test data provided by
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 - » Schlumberger
 - » Baker Atlas
 - » Dynamit Nobel

Subject

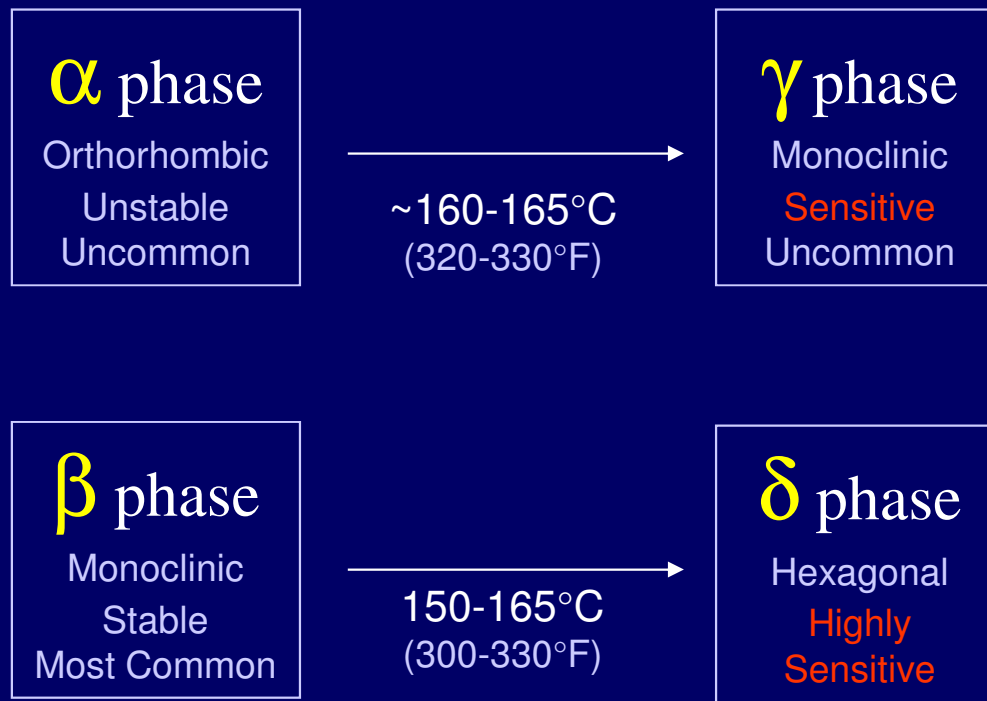
- What effect does temperature exposure have on nitramine explosives?
- Are the effects reversible?
- How should exposed charges be retrieved and handled?
 - » Service company recommendations vary
 - » Operators concerned by HSE vs. lost rig time

Summary of Effects

- No observed increase in sensitivity of RDX[†], even if time-temp limits exceeded
- HMX undergoes phase transitions
 - » Crystal structure changes
 - » Sensitivity is significantly increased
 - » Changes very slow to reverse
 - » Requires special retrieval procedures

[†] HNS and PYX were similarly unaffected

HMX Phase Changes



HMX Phase Changes

- Primary concern is β to δ phase change
 - » Observed as low as 150°C (300°F)
 - » Significant increase in impact sensitivity (becomes more sensitive than PETN or lead azide)
 - » Slow reversal (days), even if explosive is cooled

Recommendations

- Use RDX up to 110°C (230°F)
- Use HMX up to 150°C (300°F)
- Follow special procedures when retrieving any HMX explosive device that may have been exposed to temperature >150°C
 - » Cool down period is not sufficient
 - » Only unload at service company premises under special supervision

Actions

- **Acquire More Test Data**
 - » Drop testing of heated guns
 - » Impact testing of heated & cooled charges
 - » To be completed by 3Q 2005
- **Refine Conclusions**
- **Build Recommendations into API RP-67**
 - » Service companies review their procedures