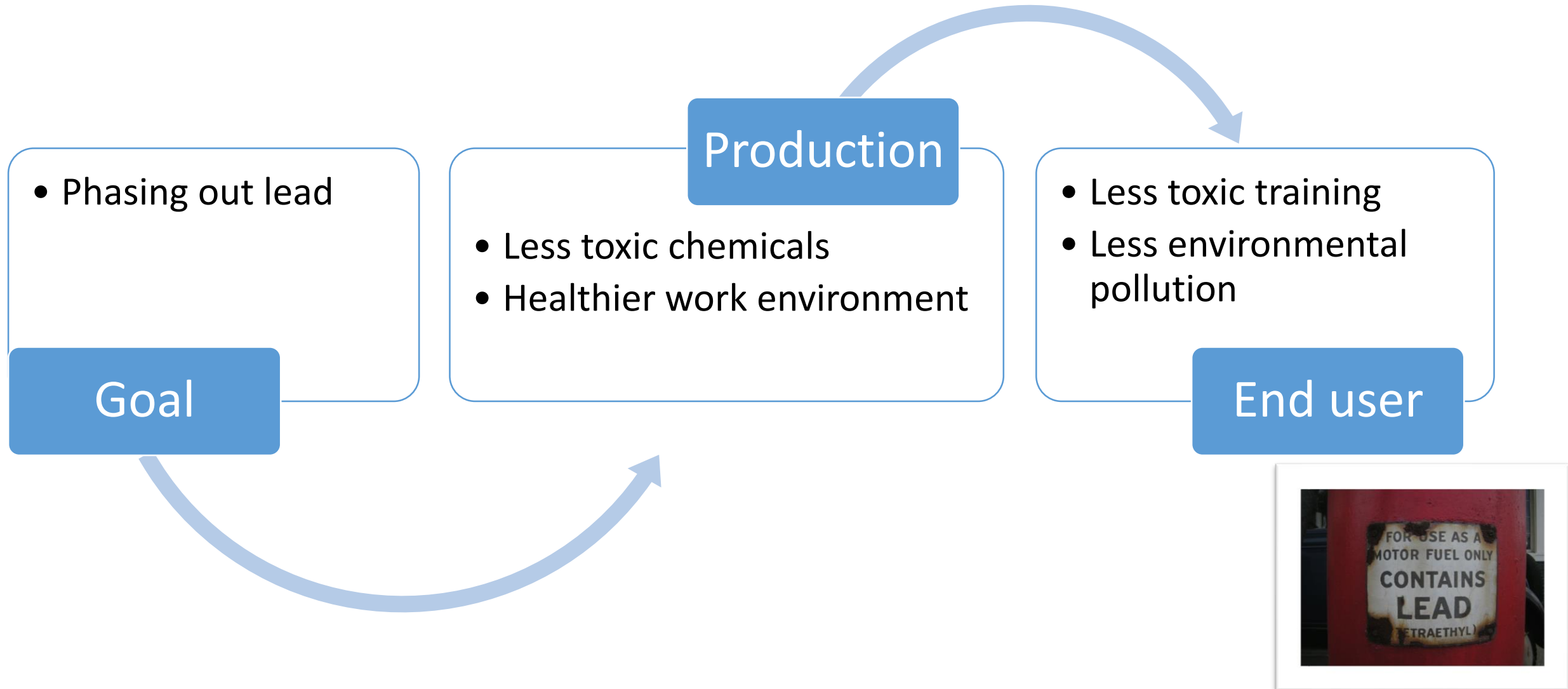




Development of extruded double base rocket propellants

– alternative ballistic modifiers

Abstract no: 22201, IMEMTS October 21-24, 2019 Seville, Spain

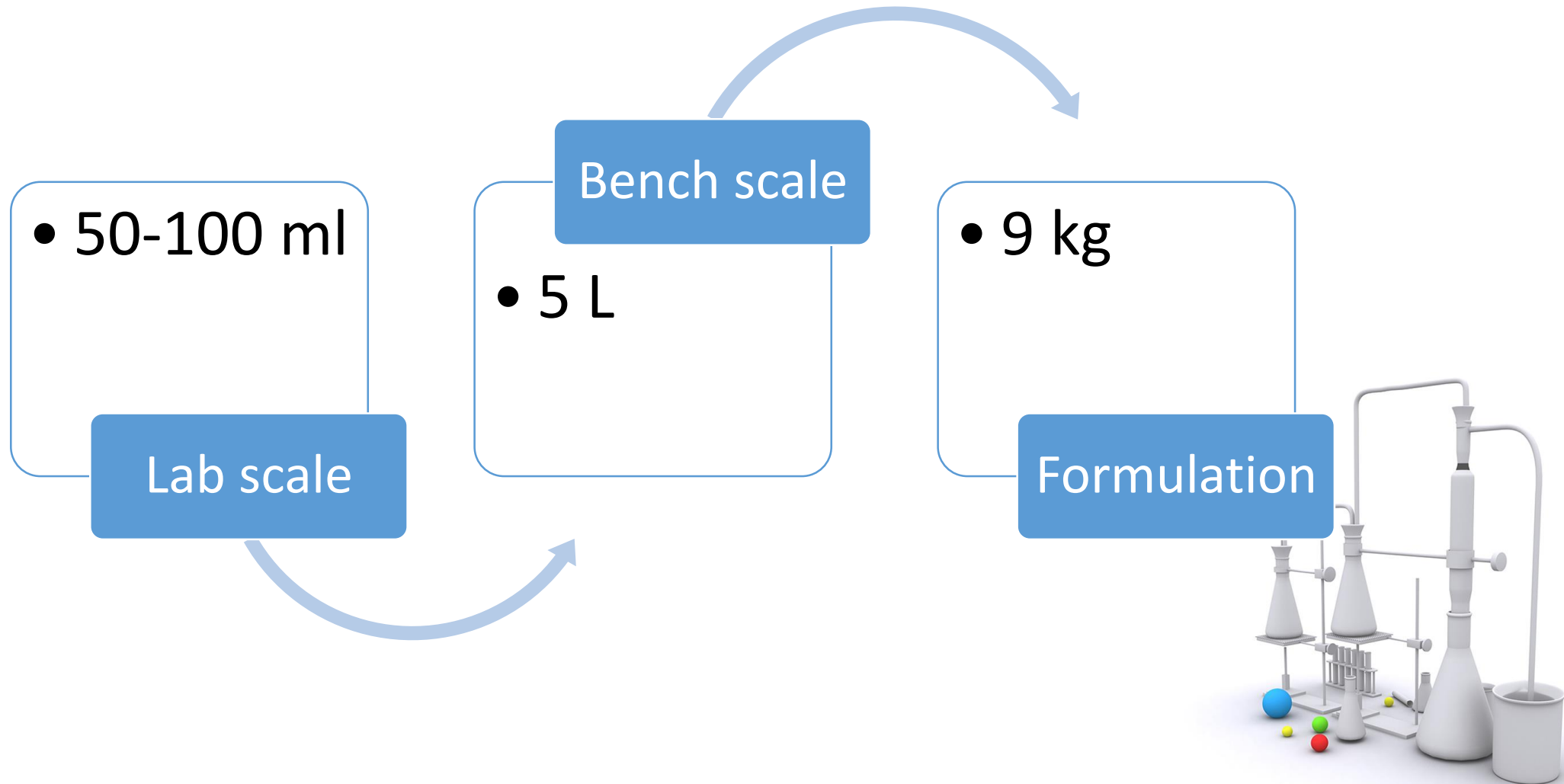


To synthesize or not to synthesize



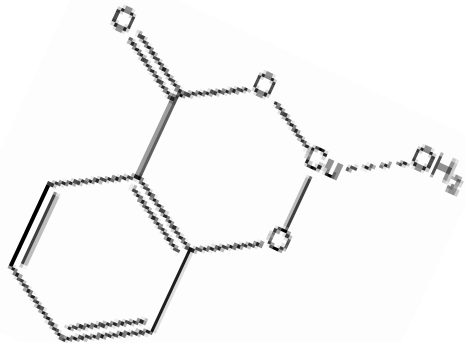
- + Improved supply chain control**
- + Manufacture on demand**
- + Improved quality control**
- Initial investment**
- Production cost**
- Identify synthesis route**





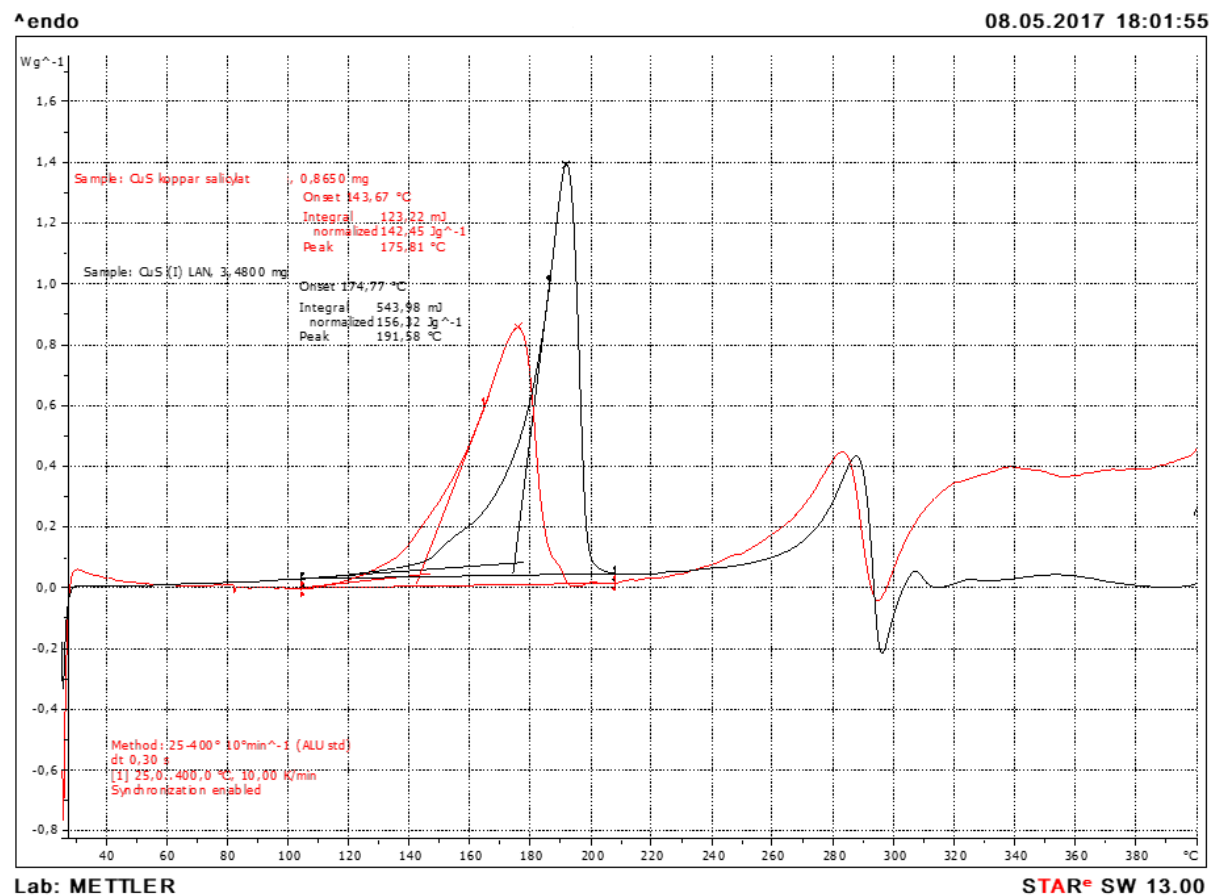
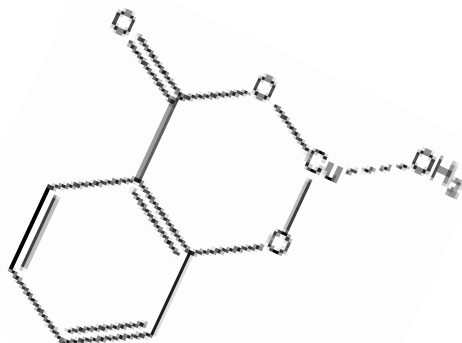
- 50 – 100 ml
- Find synthesis route
- DSC and AAS for analysis

Lab scale



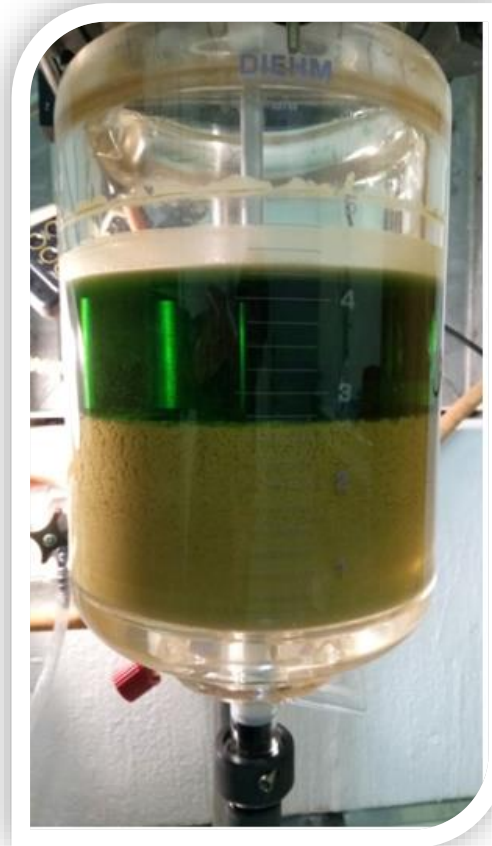
- 50 – 100 ml
- Find synthesis route
 - One-pot, one-step with water
- DSC and AAS for analysis

Lab scale



Bench scale

- 5 L
- Evaluate process parameters
- Synthesize material for testing > 300g



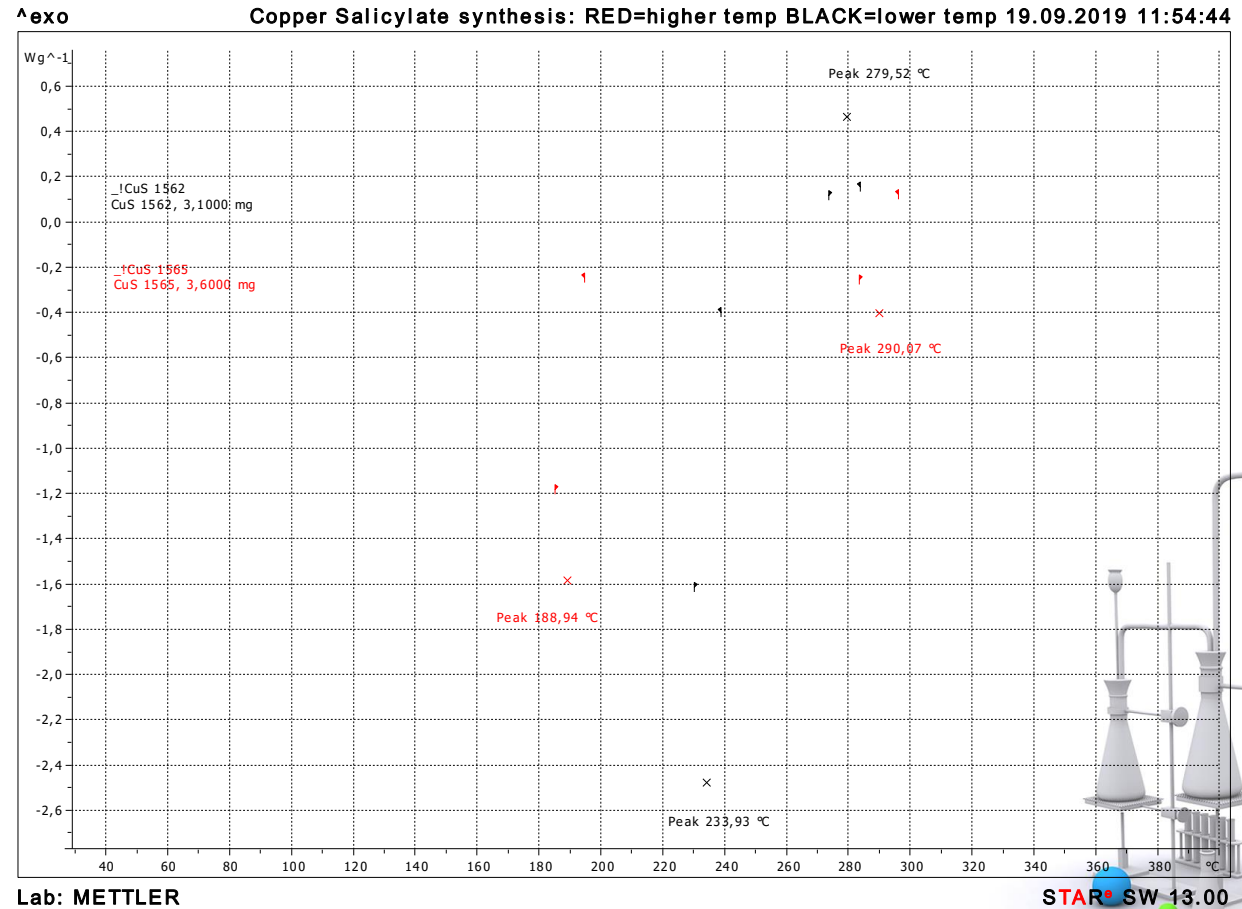
Bench scale

- 5 L
- Evaluate process parameters
- Synthesize material for testing > 300g



Bench scale

- 5 L
- Evaluate process parameters
- Synthesize material for testing > 300g



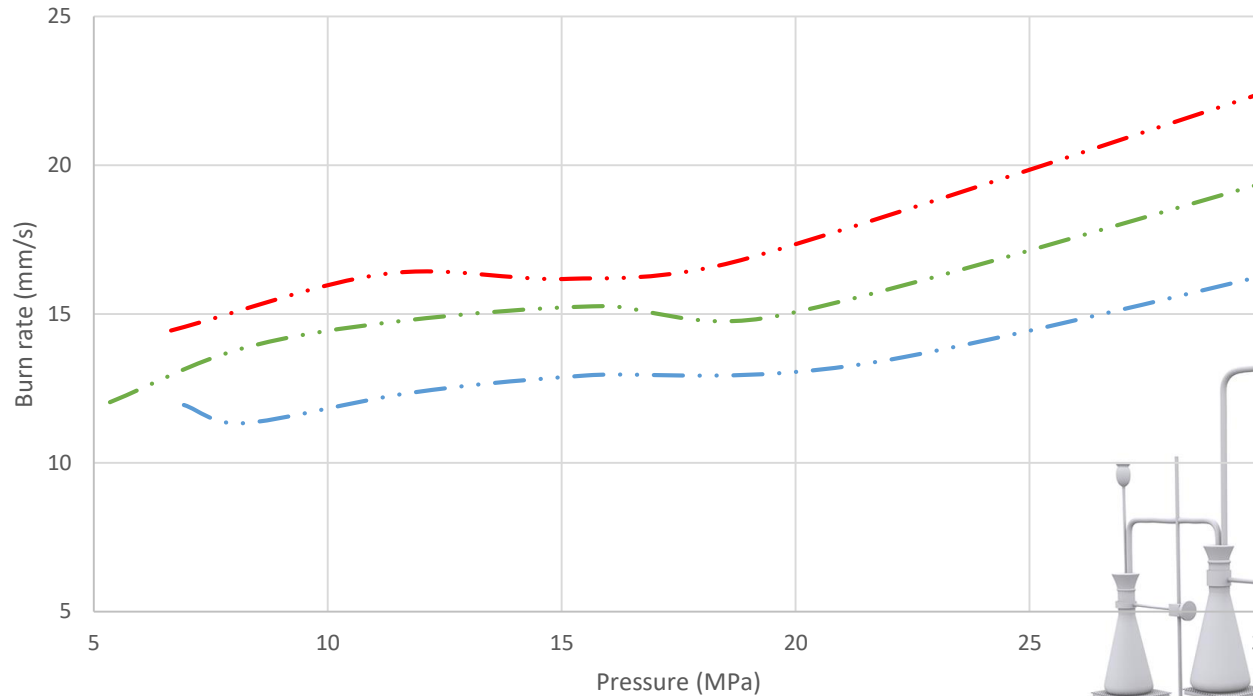
- 9 kg
- Double base extruded propellant
- Lead-free formulation

Formulation

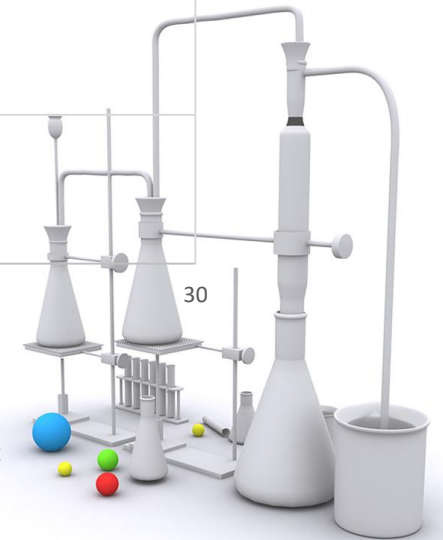


- 9 kg
- Double base extruded propellant
- Lead-free formulation

Formulation

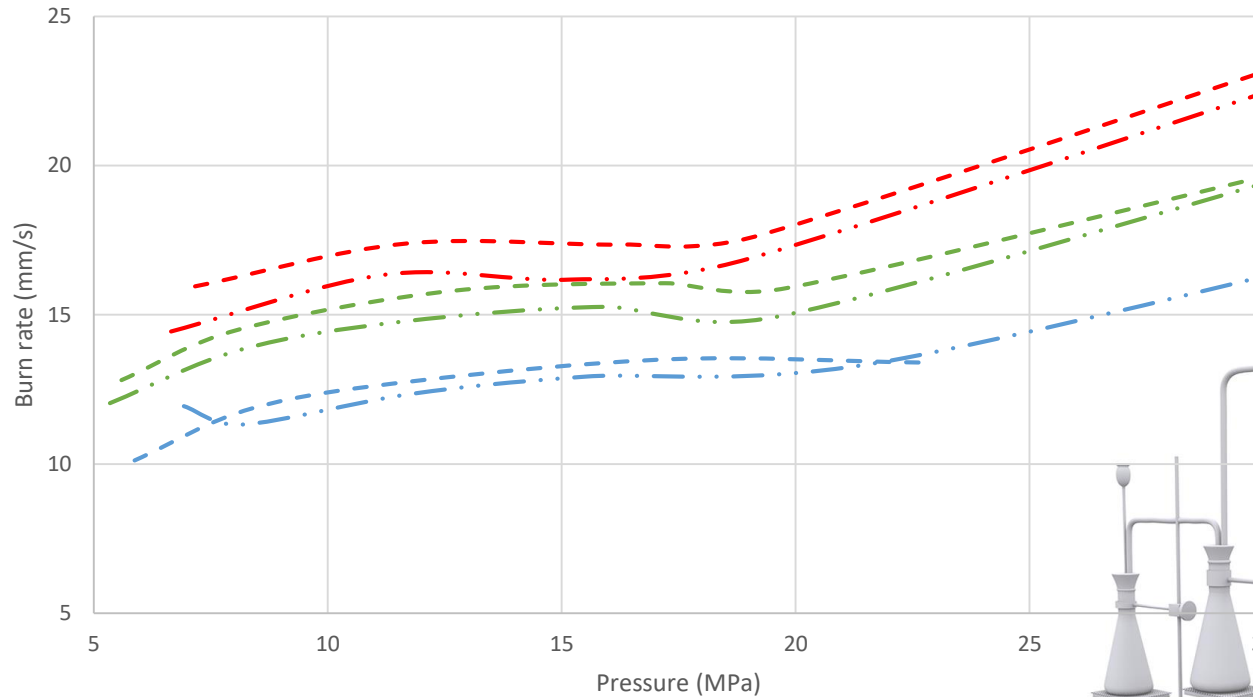


— • — Lower temp +21C — • — Lower temp -40C — • — Lower temp +60C

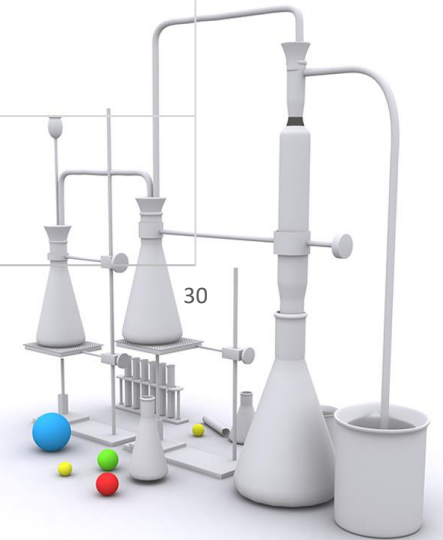


- 9 kg
- Double base extruded propellant
- Lead-free formulation

Formulation

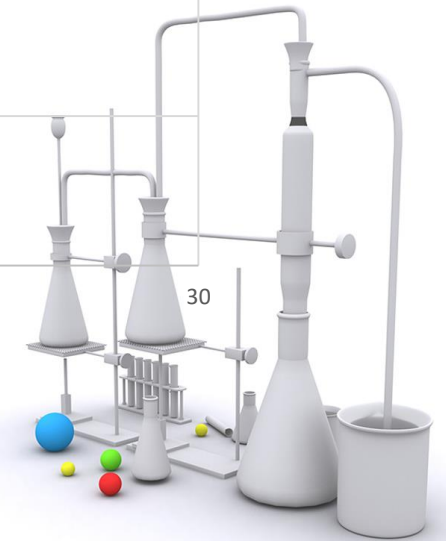
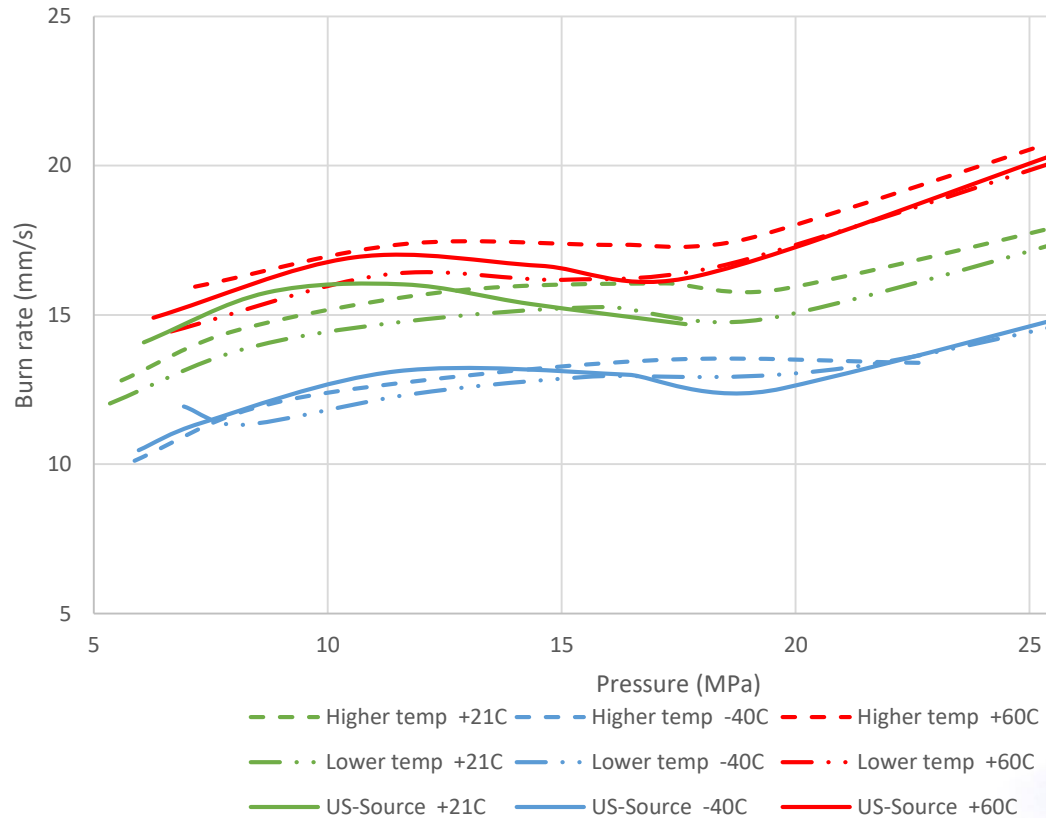


--- Higher temp +21C --- Higher temp -40C --- Higher temp +60C
 ... Lower temp +21C ... Lower temp -40C ... Lower temp +60C



- 9 kg
- Double base extruded propellant
- Lead-free formulation

Formulation



- **Alternative for copper salicylate supplier**

- Confirmed works well to synthesize, more than 500g produced total.
- Performance is comparable to sourced material
- For scale-up waste water treatment could be an issue

- **Lead free composition**

- Re-produced performance with plateau characteristic
- Other formulations are also in development

Acknowledgements

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FMV



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Nikolaj Latypov

For his expertize in synthesis and help during the study.

**Thank you for your
attention**

- Any question?