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FACULTY OF PROCESS  
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# Minimum ignition temperature of hybrid mixtures

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# Safety Characteristics

- Mostly pure experimental values
- Different standards for dust and liquid/vapor/gas
- Hybrid mixture: two or more combustible substances with different states of aggregation

# Hybrid Mixtures:

The explosion behavior can be more critical for the mixture than for the single substance.

- the Minimum Ignition Energy is lower than that of the pure dust,
- the Minimum Ignition Temperature is lower than that of the pure dust/gas,
- the mixture is ignitable at concentrations below the Lower Explosion Limit of the single substance and
- the Maximum Explosion Rise Velocity is higher than that of the pure dust.

# Current Project: NEX-HYS

Safety characteristics of hybrid mixtures  
for explosion protection:

Determination methods capable for  
standardization

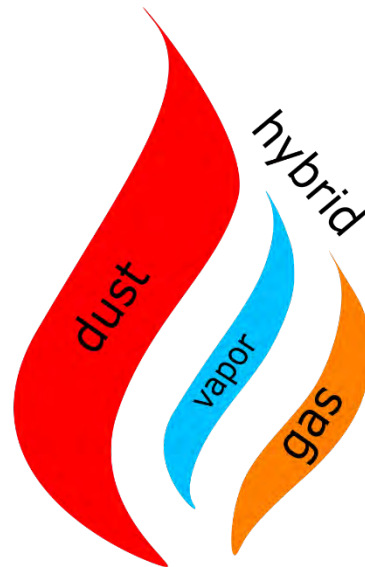
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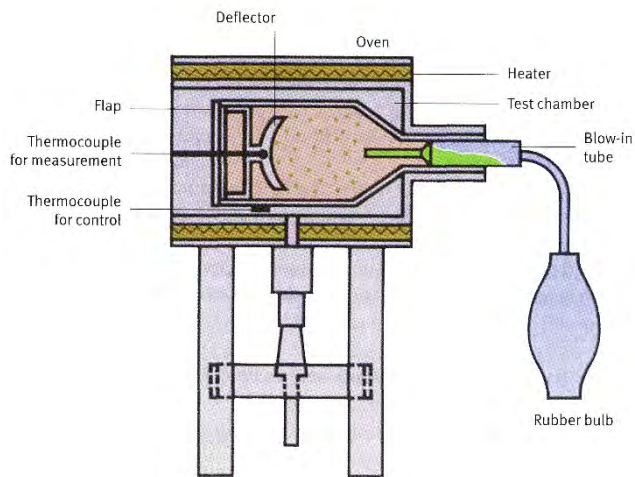
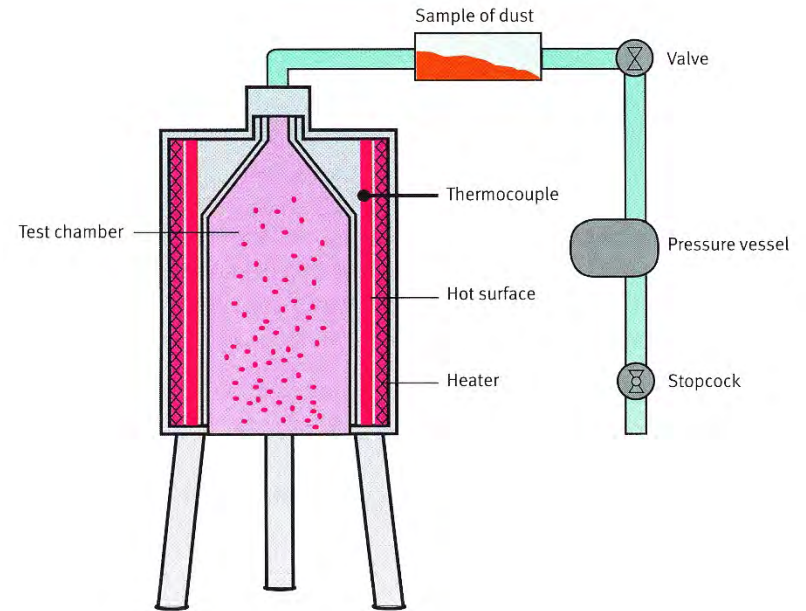
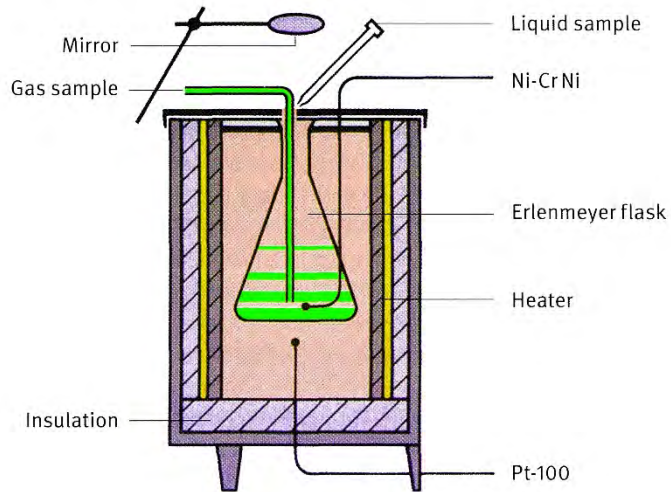
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für Wirtschaft  
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aufgrund eines Beschlusses  
des Deutschen Bundestages

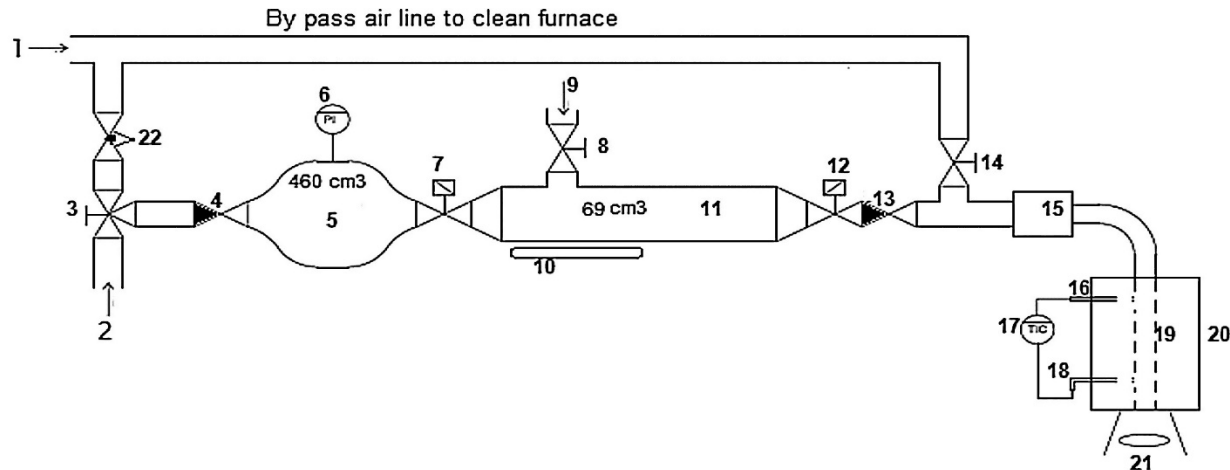
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# MIT Experiments

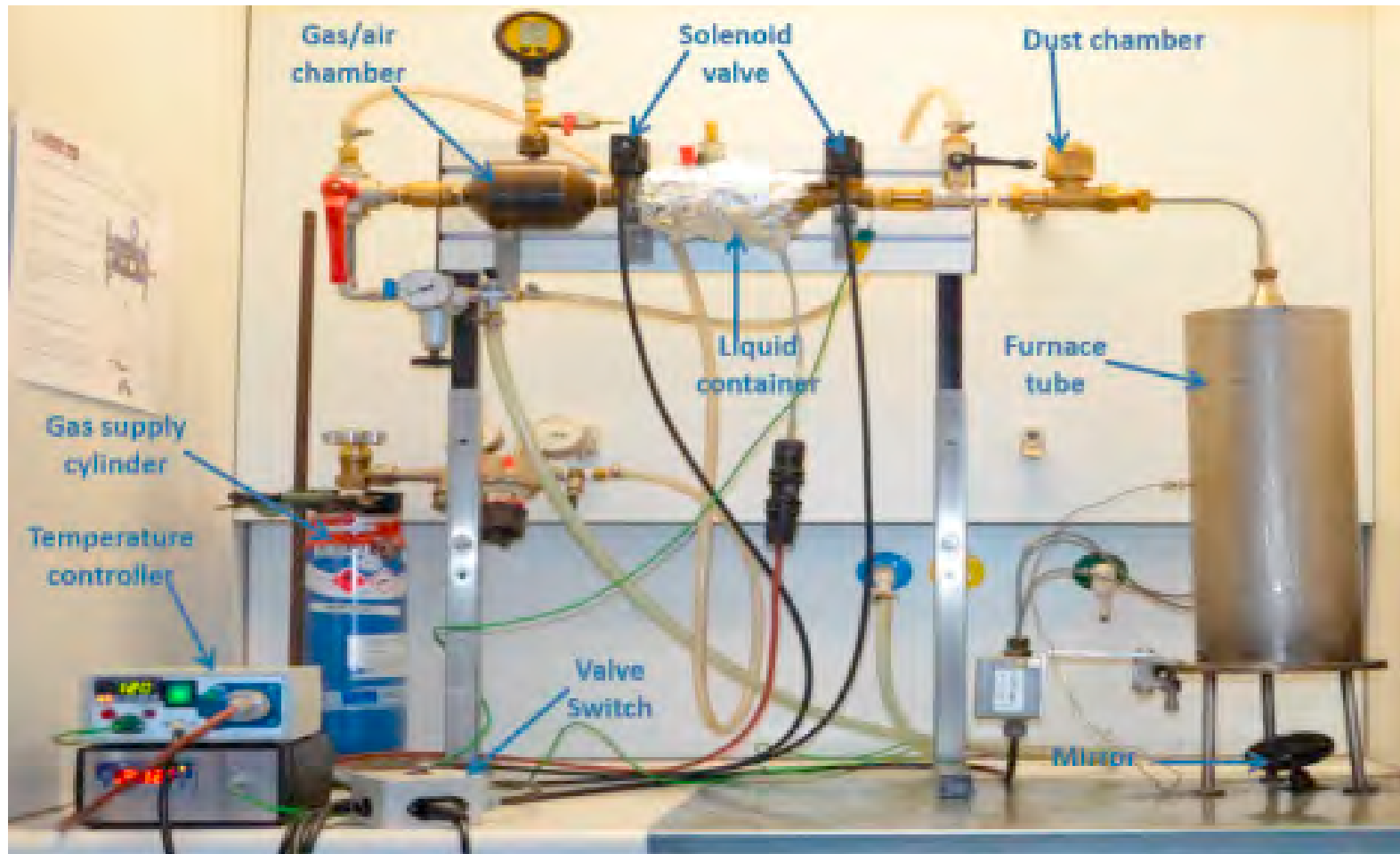


# First Modification



- |                                   |  |
|-----------------------------------|--|
| 1. Air supply                     | 12. Solenoid valve                         |
| 2. Gas supply                     | 13. Check valve                            |
| 3. T- shape ball valve            | 14. L- shape ball valve                    |
| 4. Check valve                    | 15. Dust Chamber / reservoir               |
| 5. Air / gas reservoir or gas.    | 16. Thermocouple                           |
| 6. Digital pressure gauge         | 17. Temperature controller                 |
| 7. Solenoid valve                 | 18. Electric power supply                  |
| 8. L- shape ball valve (two port) | 19. Steel furnace tube                     |
| 9. Solvent or liquid supply       | 20. Furnace shell and insulation materials |
| 10. Heating filament.             | 21. Mirror                                 |
| 11. Solvent reservoir             | 22. Air regulating valve                   |

# Realisation



# Pure substance values

dust	MIT [°C]	gas	MIT [°C]	solvent	MIT [°C]
Wood	460	Hydrogen	540	Toluene	535
HD-PE	340	Methane	600	Hexane	225
Starch	380				



# MIT of two component mixtures

Reduction of the MIT of dust due to the admixture of gas or solvent

dust	$\Delta$ MIT by adding 0.8 vol% Hexane [K]	$\Delta$ MIT by adding 0.6 vol% Toluene [K]	$\Delta$ MIT by adding 3.0 vol% Hydrogen [K]	$\Delta$ MIT by adding 2.0 vol% Methane [K]
Wood	20	0	0	0
HD-PE	15	0	0	0
Starch	5	0	0	0

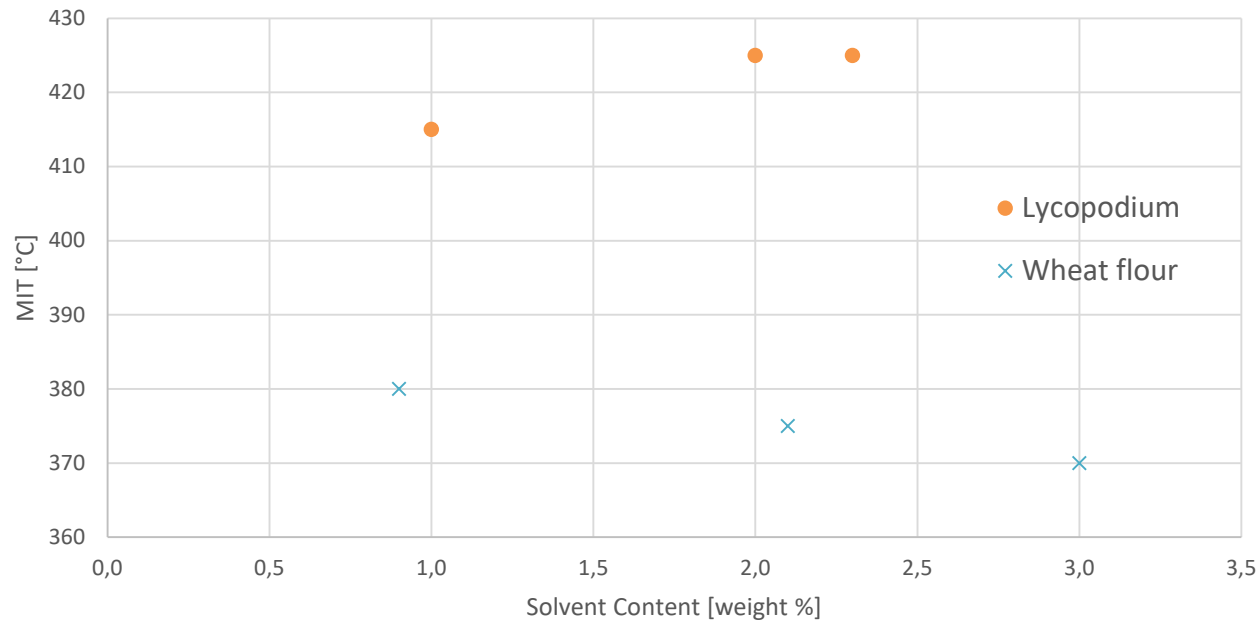
# MIT of two component mixtures

Reduction of the MIT of gas or solvent due to the admixture of dust

dust	$\Delta$ MIT by adding 87 g/m <sup>3</sup> HD-PE [K]	$\Delta$ MIT by adding 82 g/m <sup>3</sup> Starch [K]	$\Delta$ MIT by adding 97 g/m <sup>3</sup> Wood [K]
Methane	30	15	10
Hydrogen	35	30	0
Hexane	0	0	0
Toluene	25	15	0

# MIT of two component mixtures

## Dust premixed with solvents



# Outlook

- 2 years project on hybrid mixtures just started
- MIT only one of several Safety Characteristics
- Aim to prepare an extended standard
- Open for participation