

Laboratory-scale instrumented bench for the evaluation of fire-resistant systems

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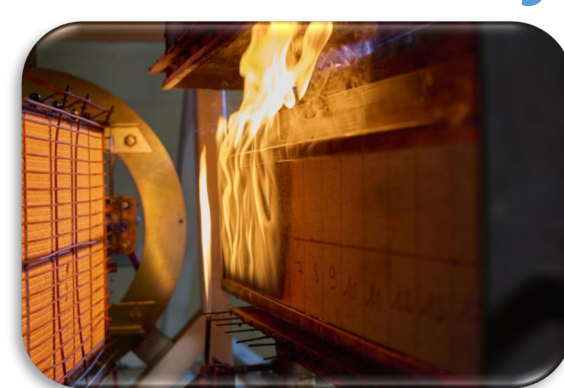
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Context

Regulation & certification



ISO 22899-1:2007
(jet fire test effectis®)



ISO 5658-2
(Crepim®)



GB/T 31467.3
(Voestalpine®)

Space exploration

Atmosphere * : 8,2psi/34%O₂
No standardization (yet)



*HEOMD Utilization and Strategy Overview: From ISS to Moon to Mars
Julie Robinson, Ph.D. Chief Scientist, Human Exploration and Operations
NASA Headquarters. 16 August 2021 National Academies BPS Decadal
Committee

Development of new products



fire testing is
time-consuming and expensive

less expensive &
short time

Objectives

Development of small-scale test benches that can mimic a
specific fire scenario to help the development of new
products

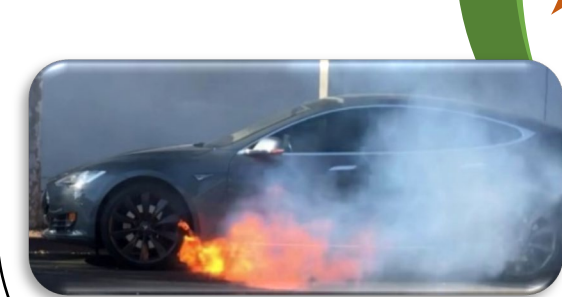
Fire scenario



Oil platform



Spaceship



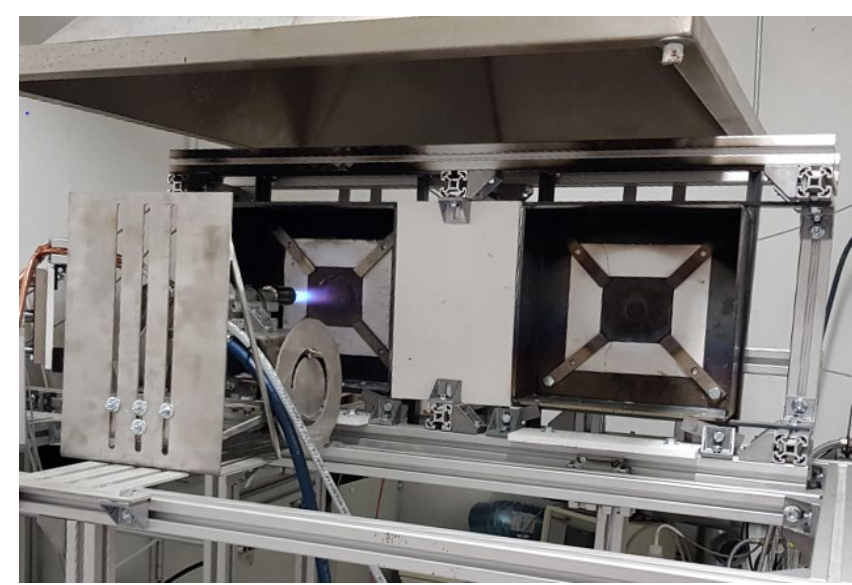
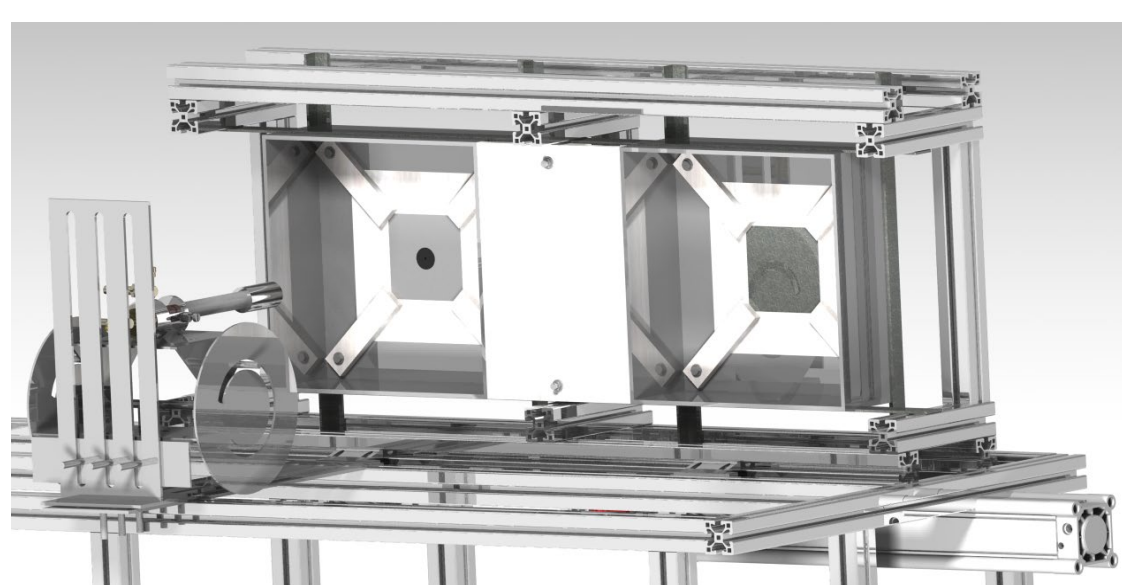
Electric car



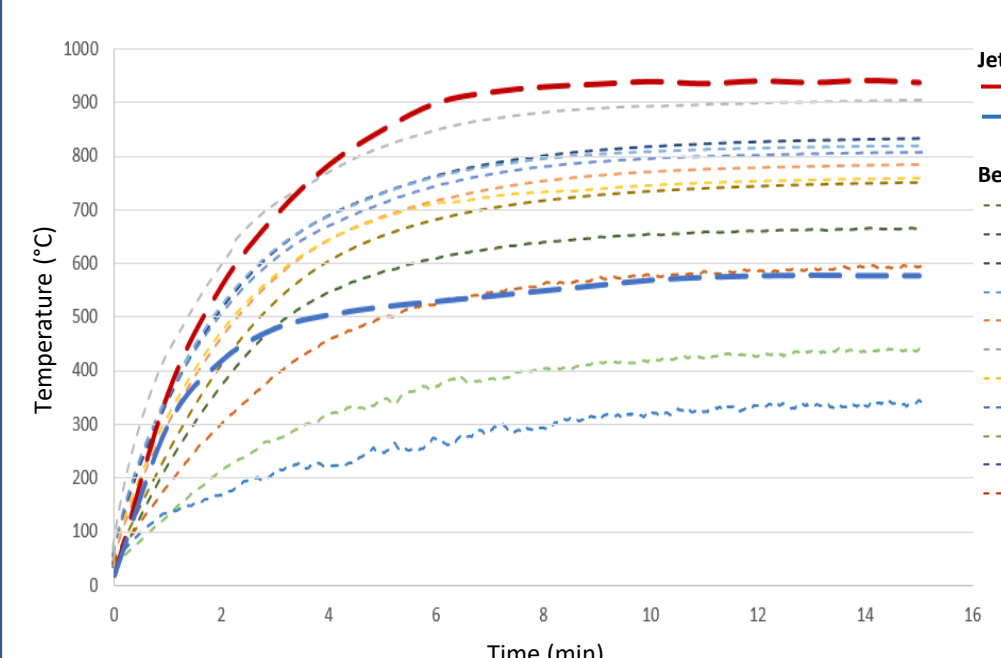
Railways

Bench scale test jet-fire
According to ISO 22899-1:2007

Bench scale test

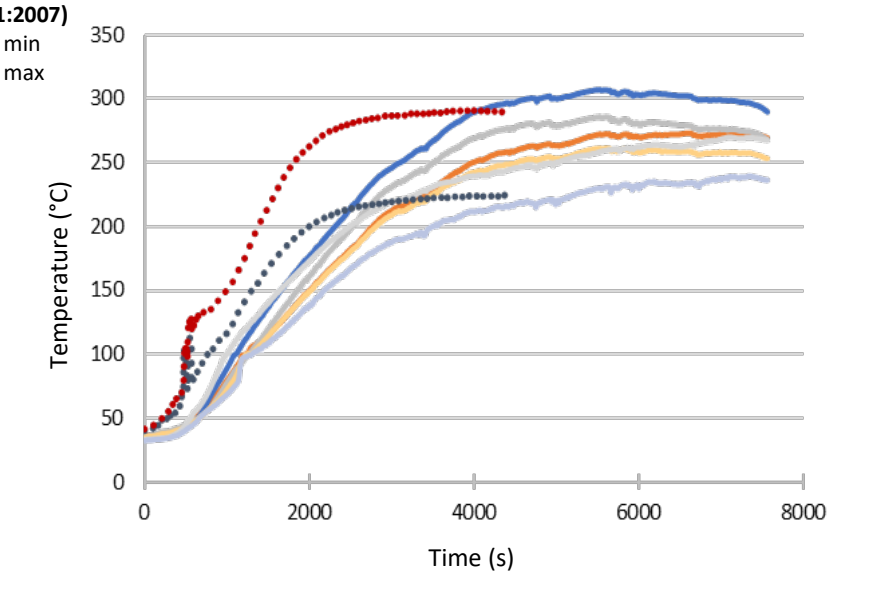


Fire scenario



Results

Bench scale test versus fire test

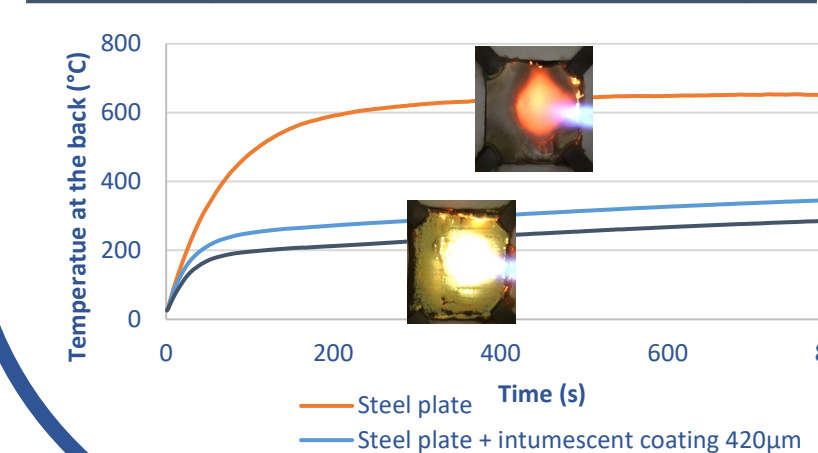


Outlook

Development of new concepts

Bench evolution

According to ISO 22899-1:2007



Heat flux
150kW/m² to > 400kW/m²

Different burners

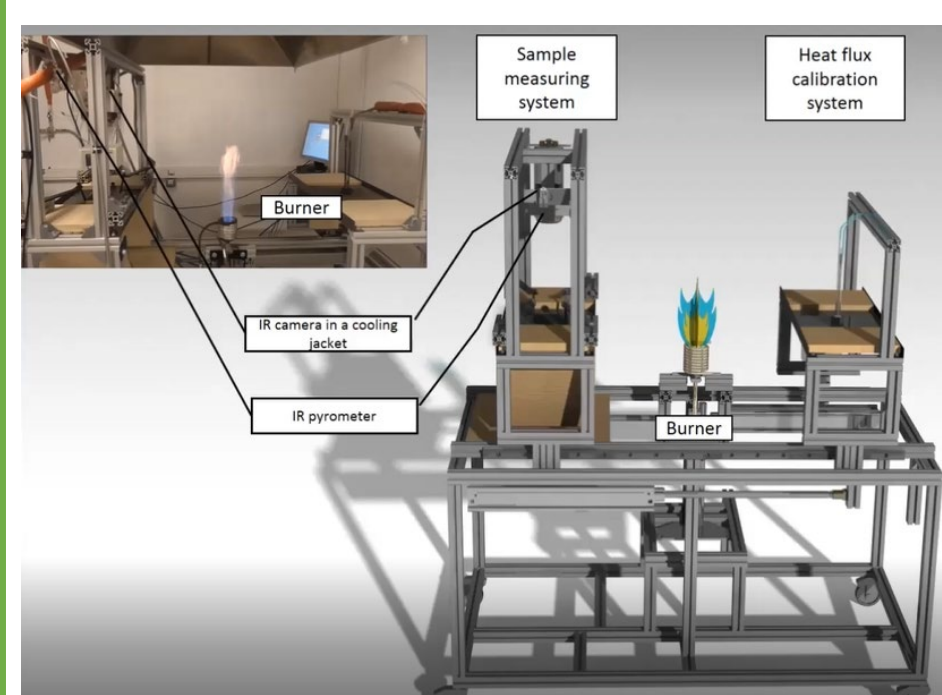
Mix propane/oxygen



Hydrogen

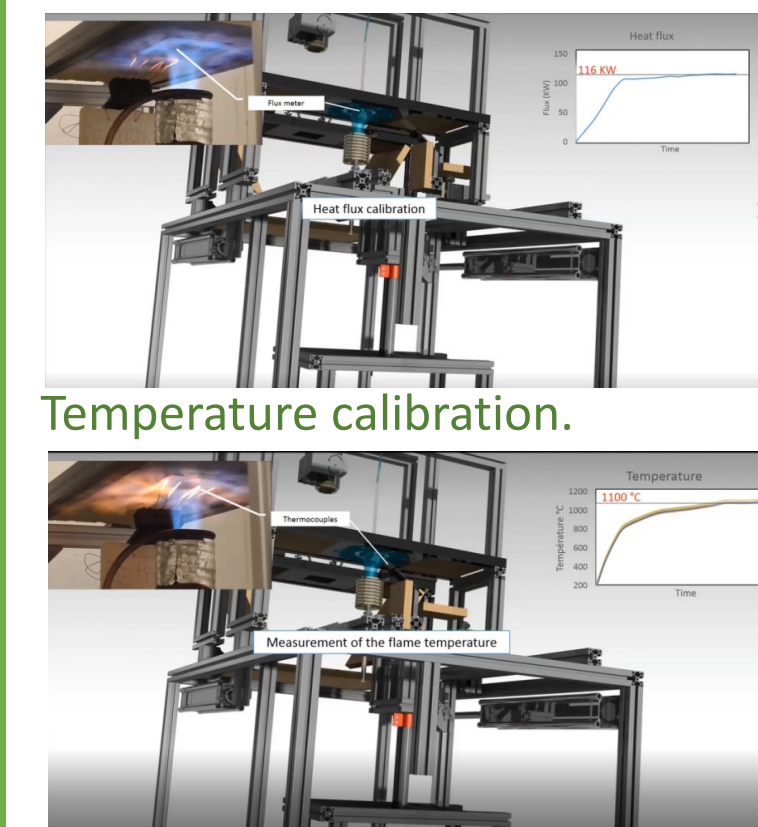


Bench scale test



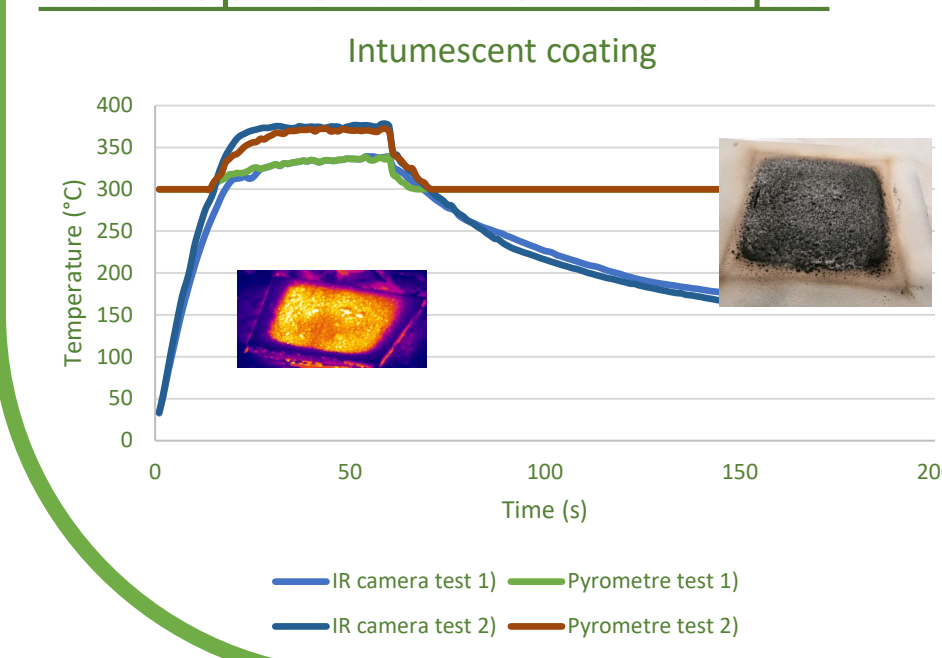
Step one : flame calibration

Heat flux calibration.



Outlook

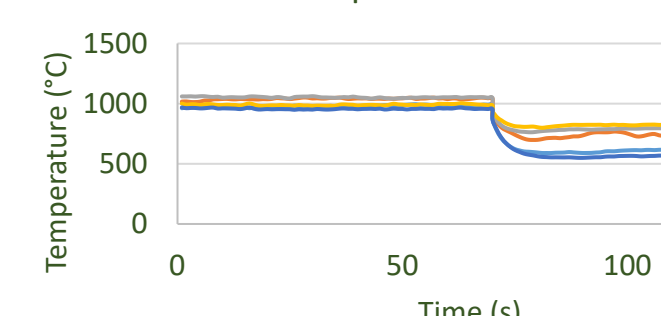
Development of new concepts



Fire scenario

According to GB/T 31467.3

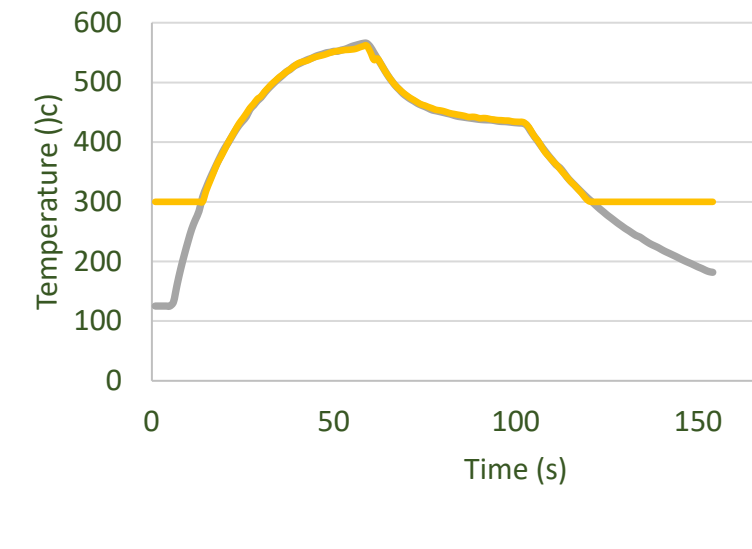
Temperature calibration



Results

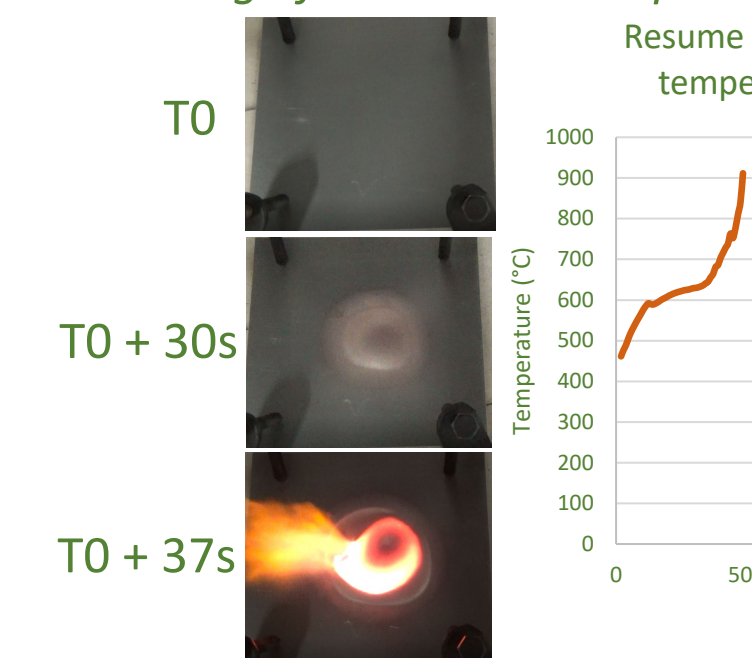
Bench scale test versus fire test

Aluminium plate

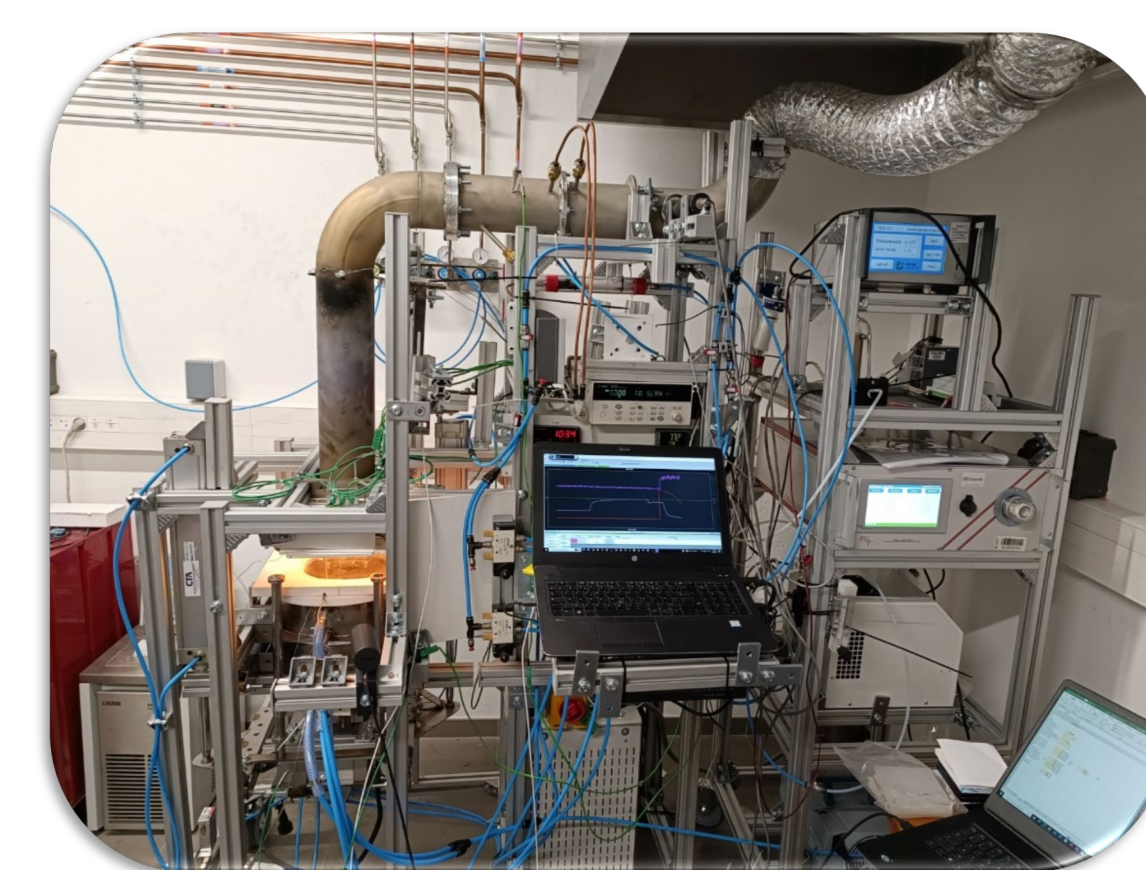


Bench evolution

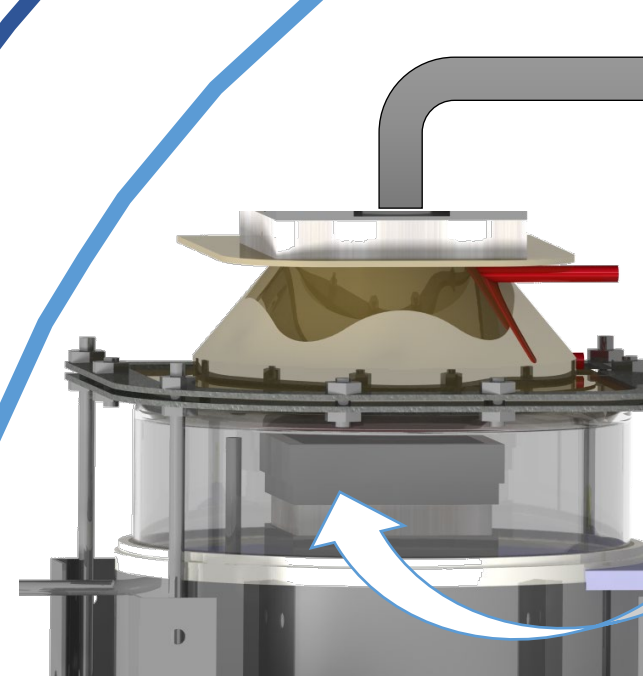
Piercing of the aluminium plate



Bench scale test



Fire scenario



Controlled atmosphere

Air (21% O₂)

Oxygen-enriched

Air (21% O₂)

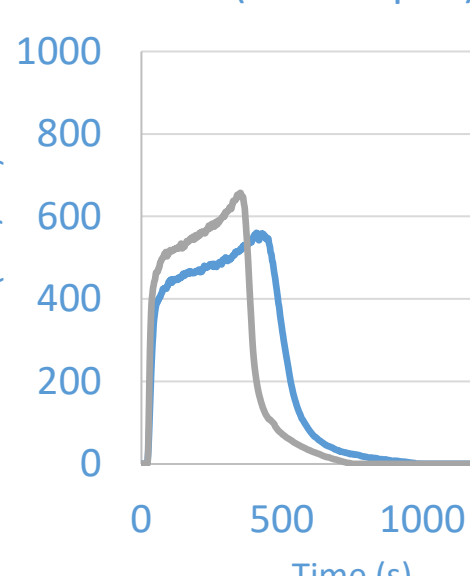
Oxygen-enriched

Thermopile

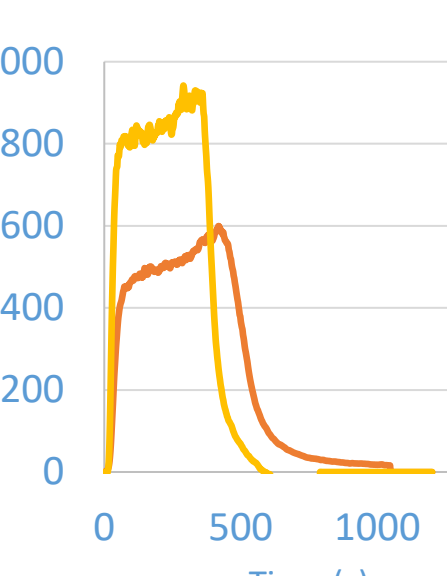
Oxygen consumption

Results

PMMA (thermopile)



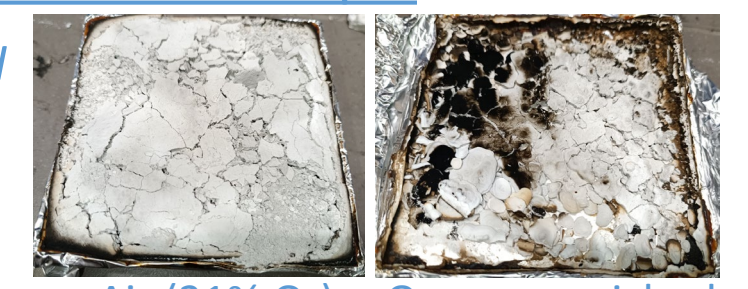
PMMA (O₂ analyser)



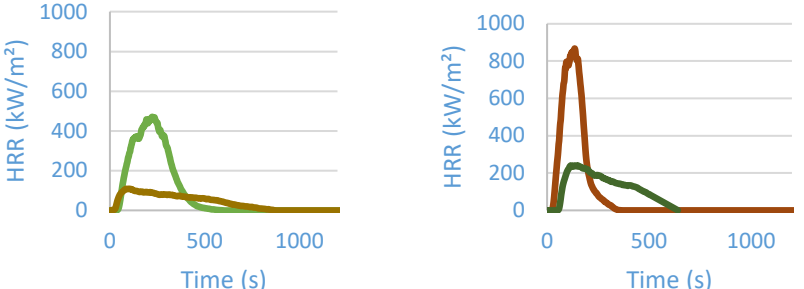
Outlook

Development of new concepts

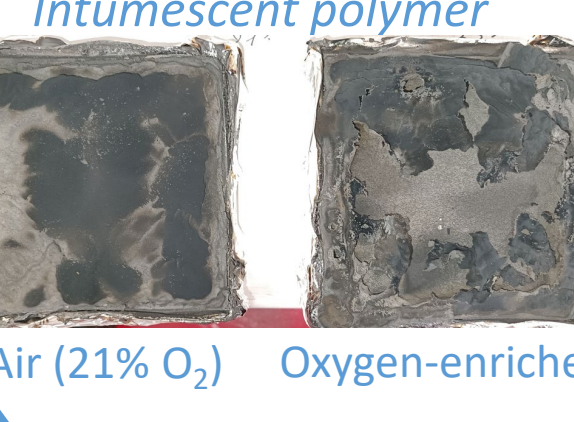
EVA 28 65%ATH



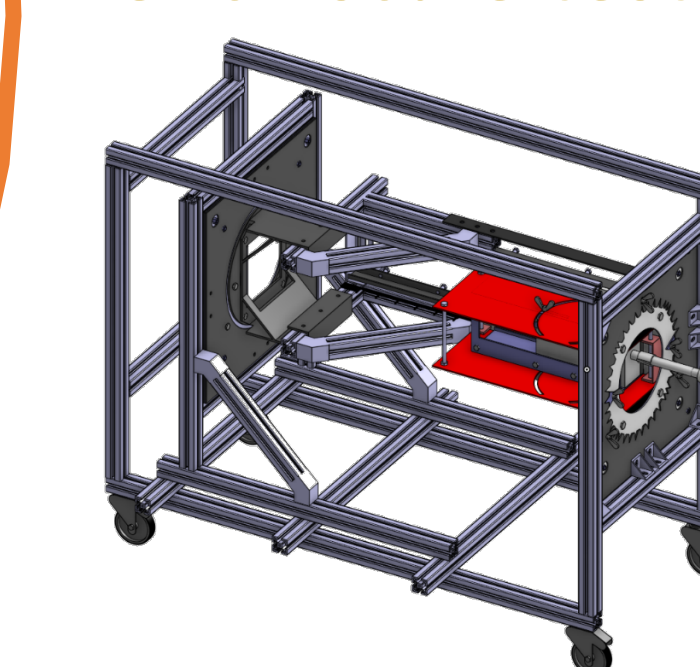
Air (21%O₂)



Intumescent polymer



Bench scale test



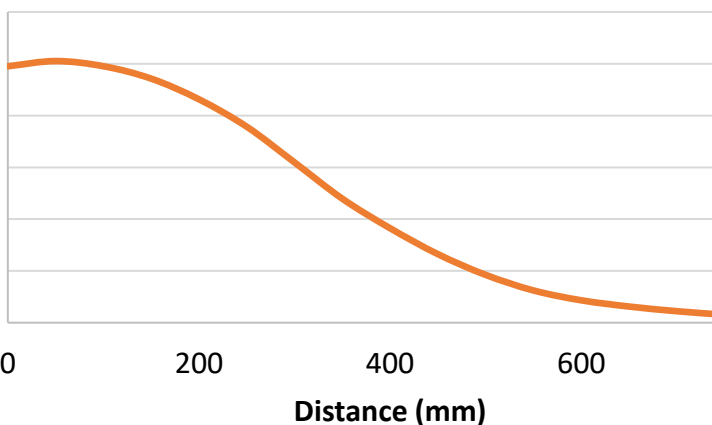
Fire scenario

Test ISO 5658-2

Sample test ISO 5658-2 : 150 mm * 795mm

Ratio : 2,68 (sample size)

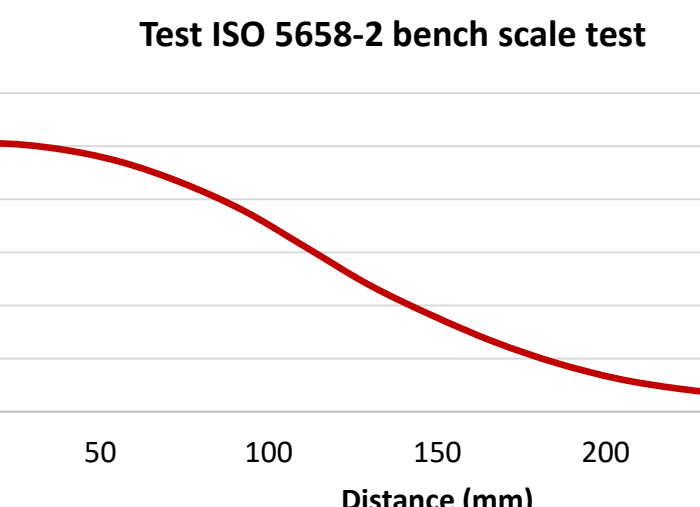
Test ISO 5658-2



Bench scale test ISO 5658-2

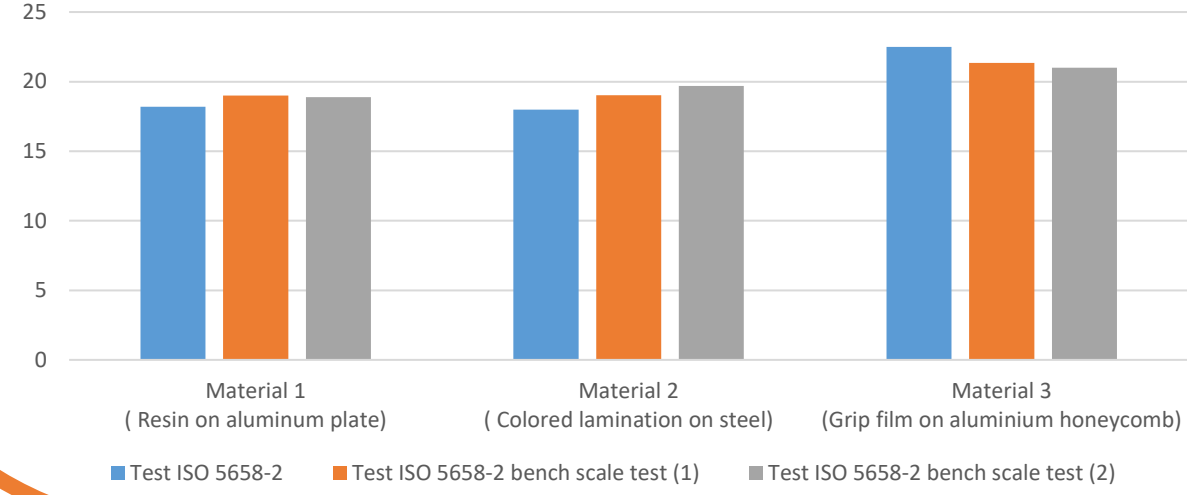
Sample bench scale test 100 mm * 280mm

Test ISO 5658-2 bench scale test



Results

Bench scale test versus fire test



Outlook

Development of new concepts



Bench scale test spread of flame (CFE)
According to ISO 5658-2