METEORITE ABLATION AT THE HYMETS ARC-JET FACILITY

Dr. Brody K. Bessire

HYMETS Sample Preparation and Test Facility

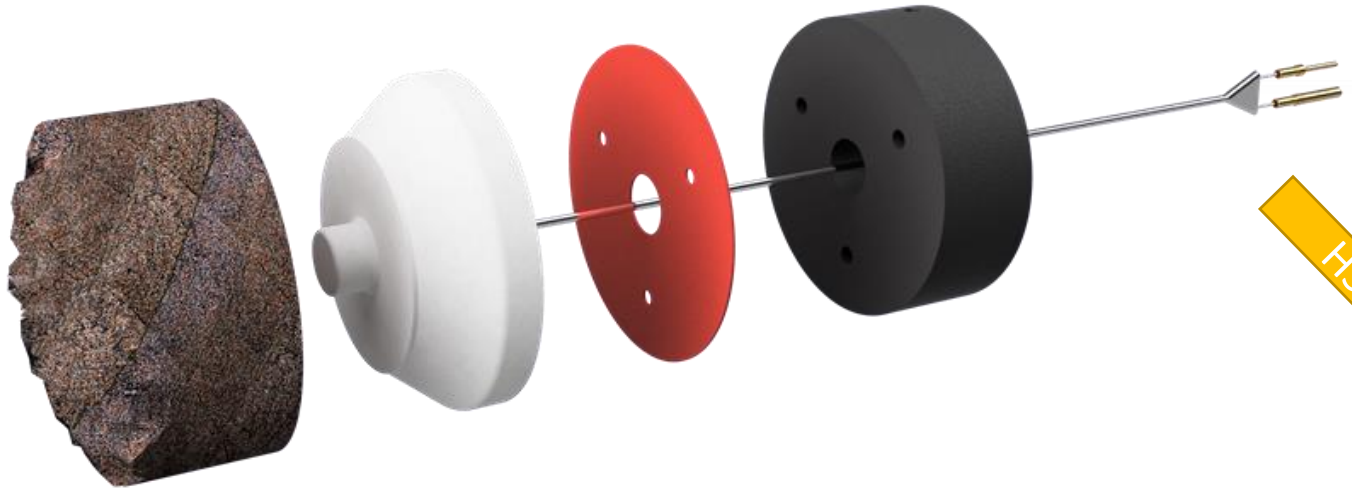
Objectives:

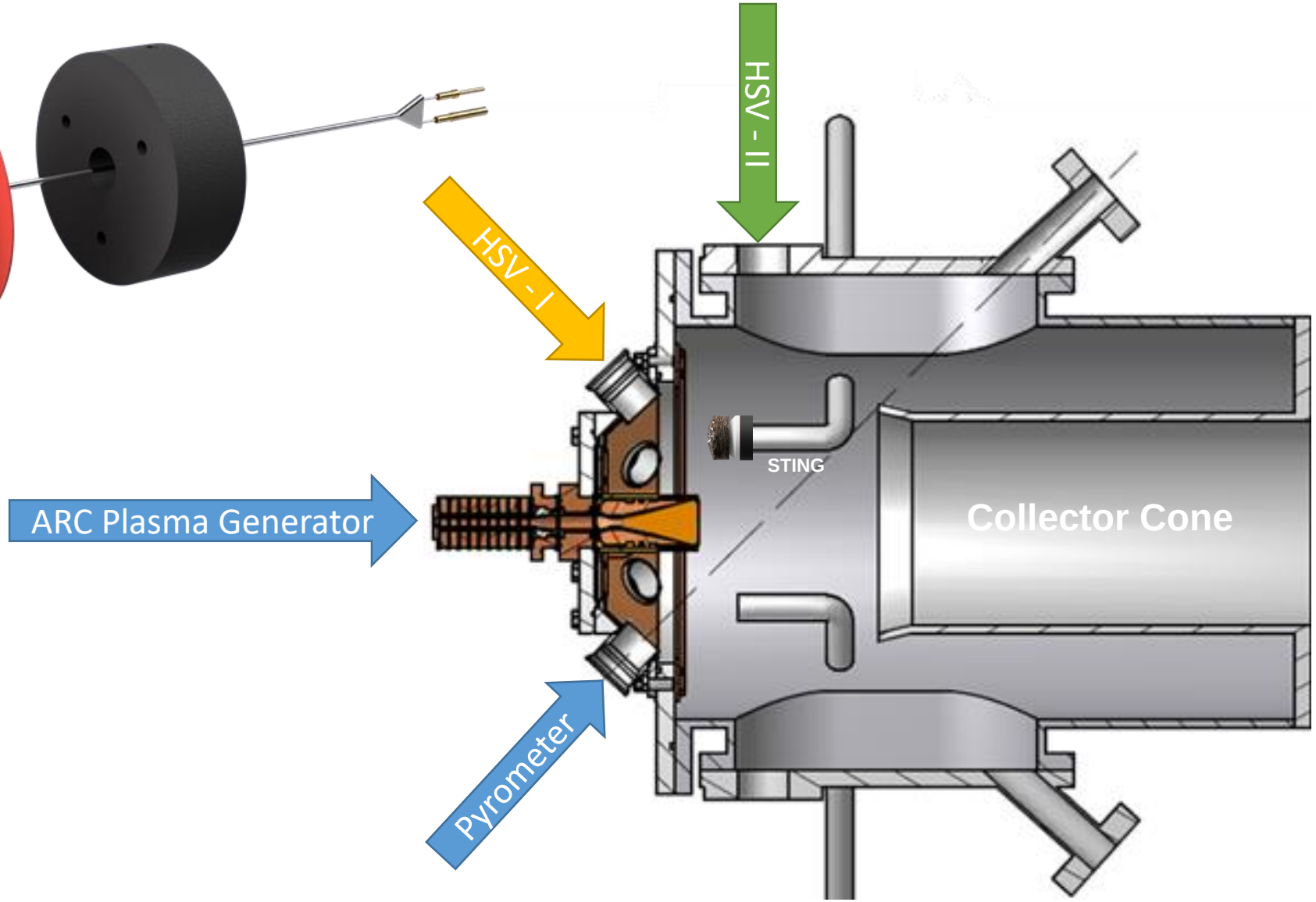
1) Introduction to Asteroid Threat Assessment Project (ATAP).

2) Introduction to Hypersonic Material Test System (HYMETS)

3) Test Results (e.g., Basalt and Tamdakht meteorite).

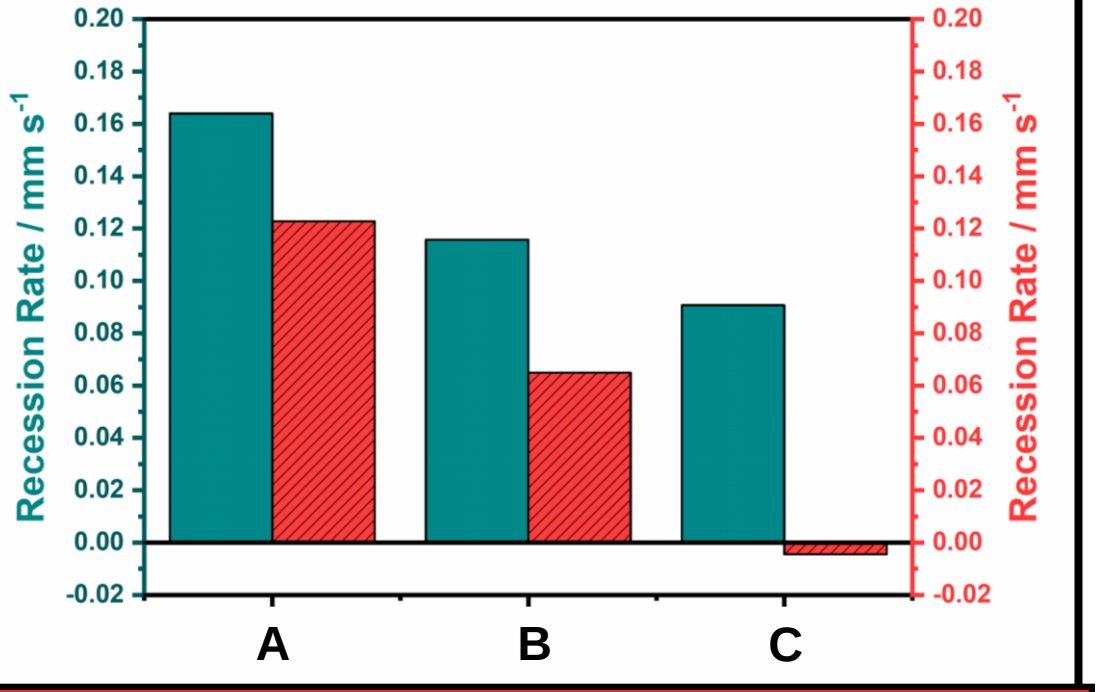
HYMETS Sample Preparation and Test Facility





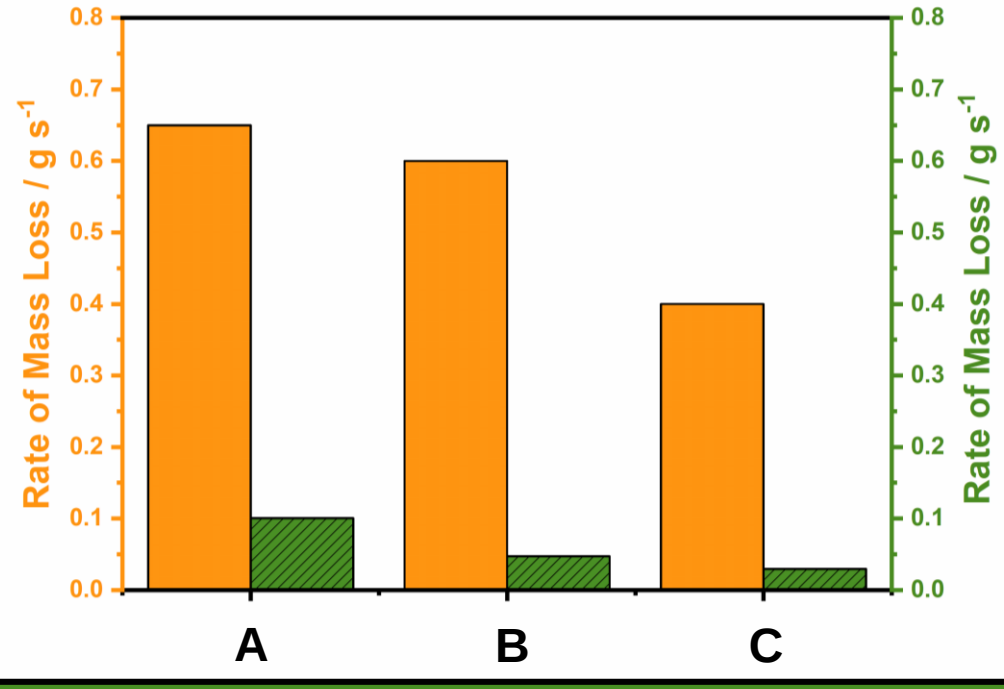
TEST CONDITIONS	Heat Flux / W cm^{-2}
A	322
B	285
C	153

BASALT RECESSION RATE



TAMDAKHT RECESSION RATE

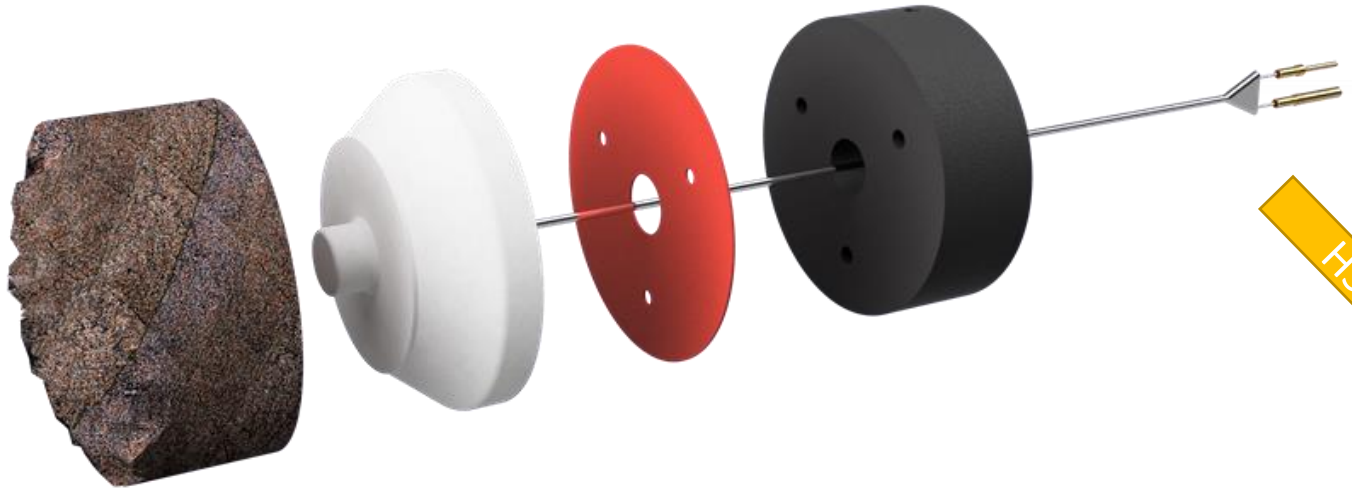
BASALT MASS LOSS

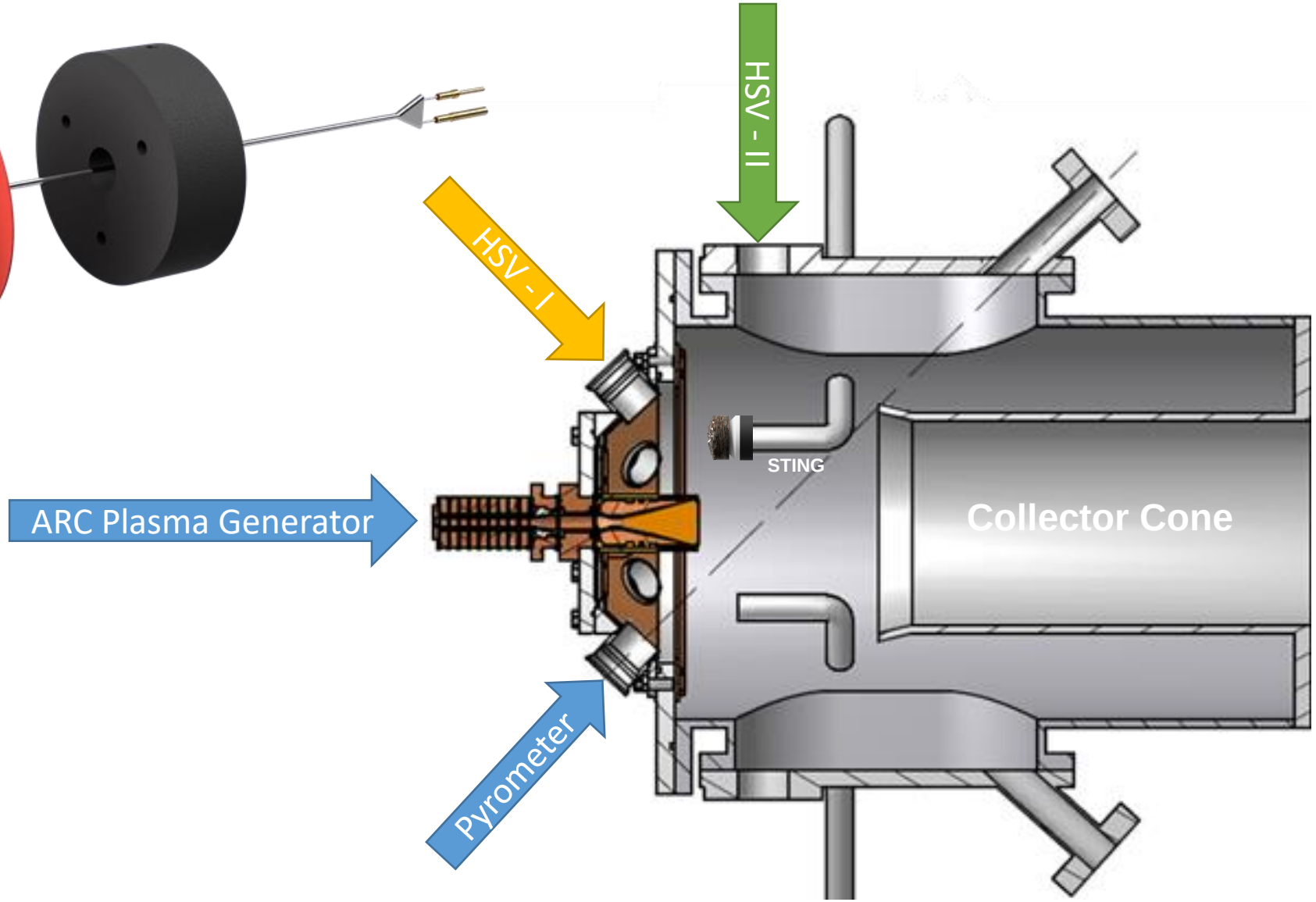


TAMDAKHT MASS LOSS

Mass loss and recession rate greater for Basalt?

HYMETS Sample Preparation and Test Facility

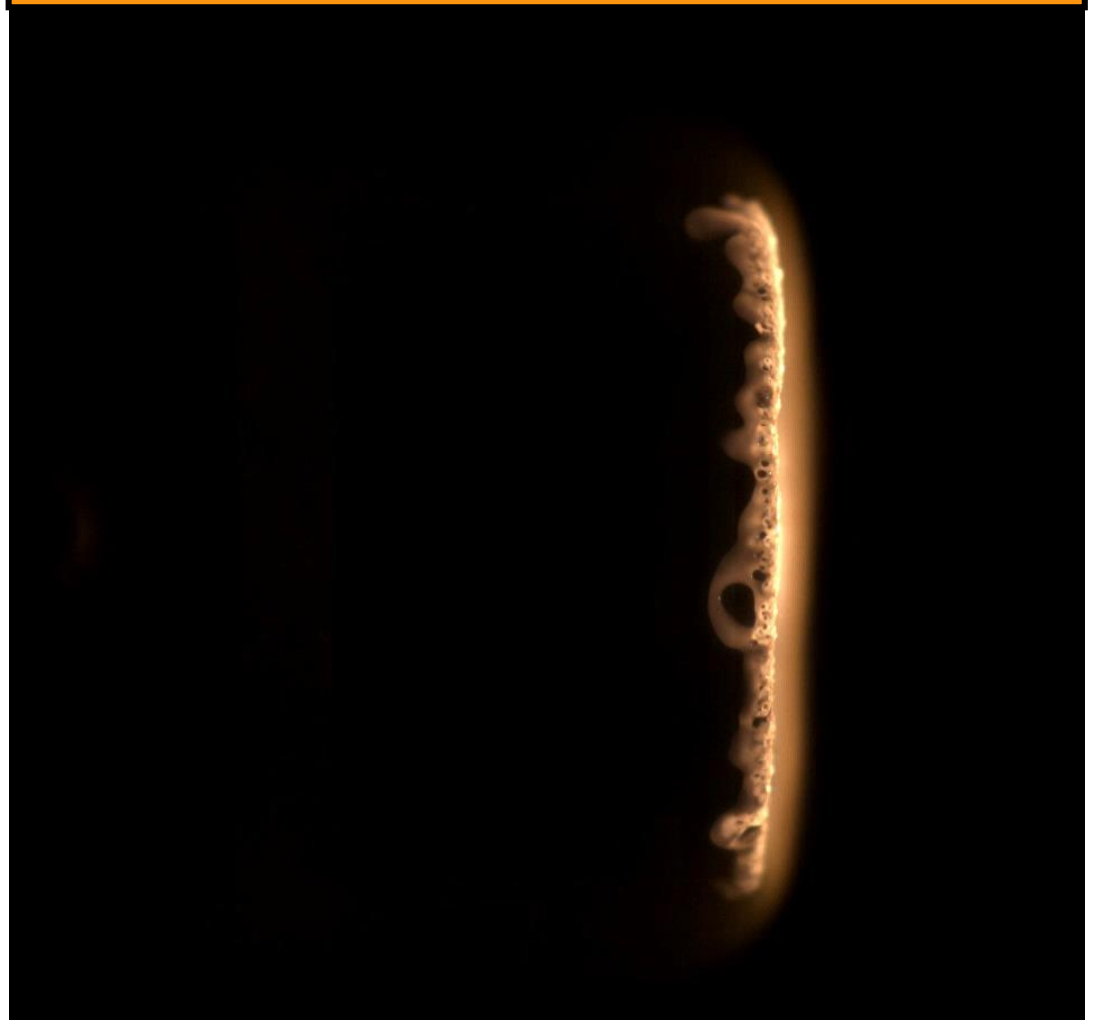




TEST CONDITIONS	Heat Flux / W cm^{-2}
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HIGH SPEED VIDEO CAPTURES INTERESTING PHENOMENA

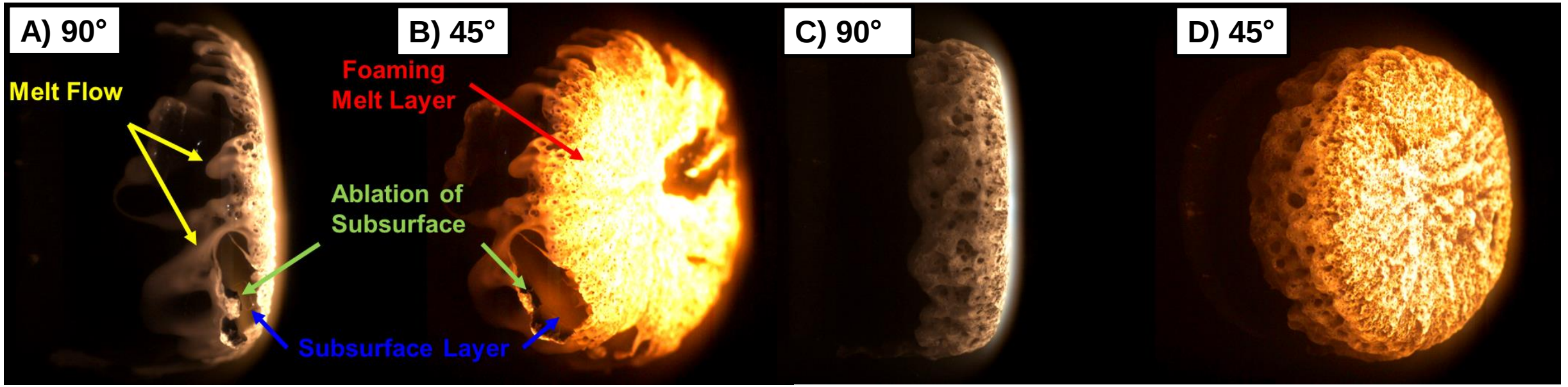
BASALT



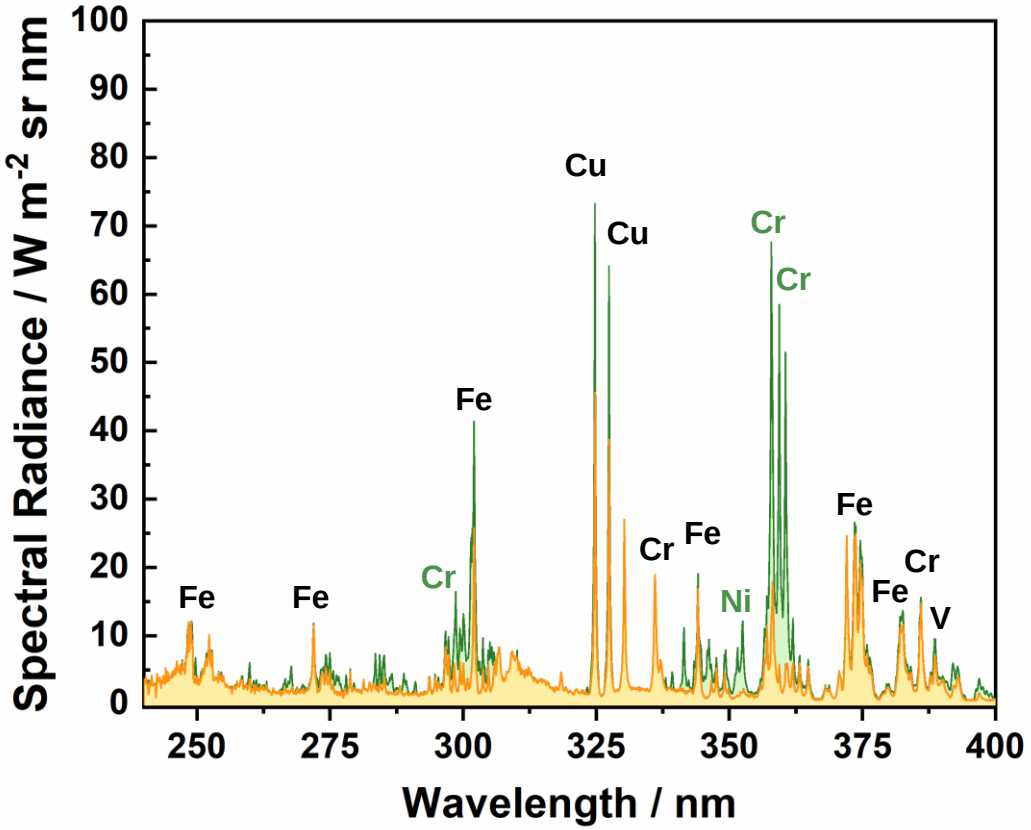
TAMDAKHT

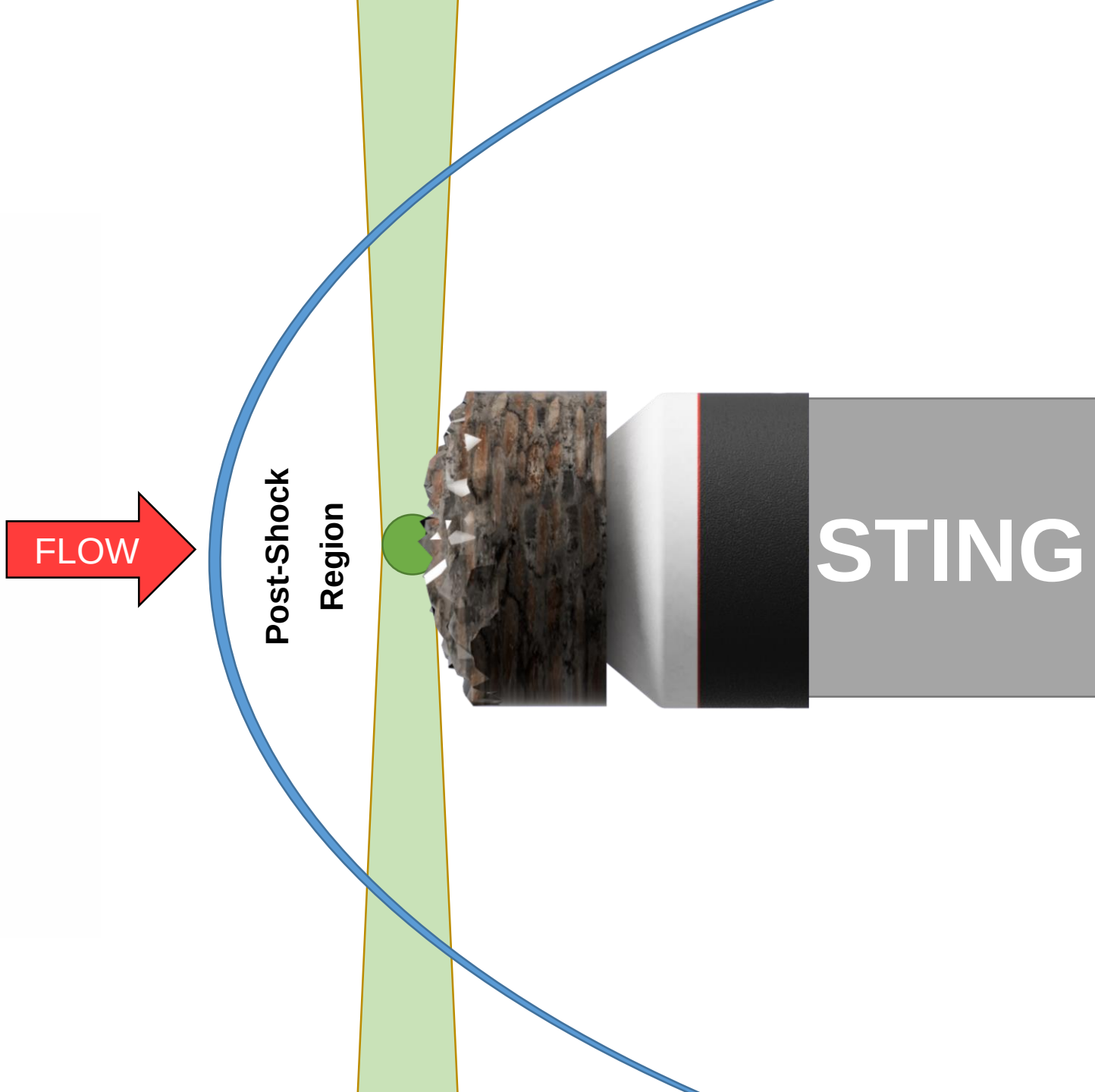


STILL IMAGES FROM HIGH SPEED VIDEO



Emission Data





X-ray Fluorescence (XRF) / Melt Layer

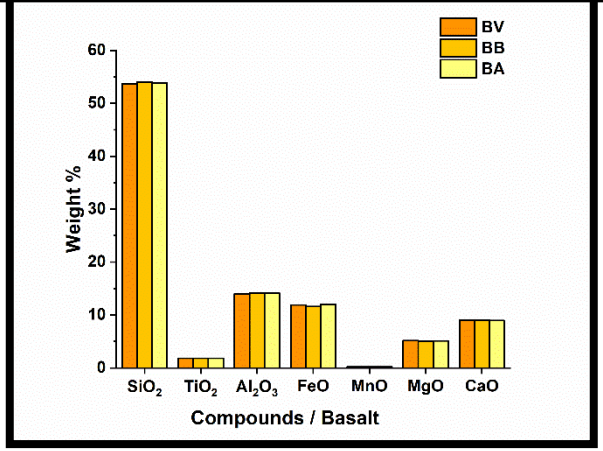
Primary Constituents

Volatile Species

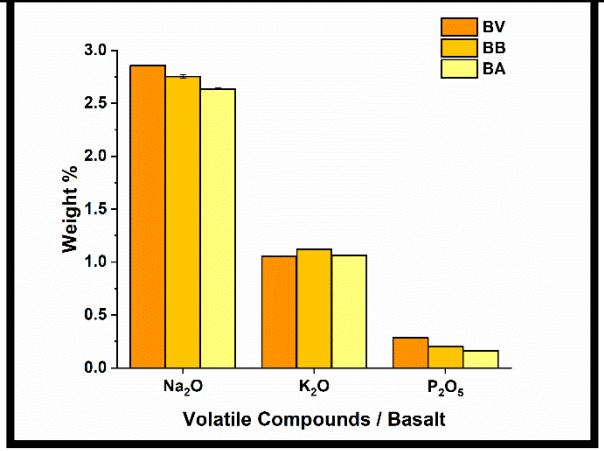
Basalt



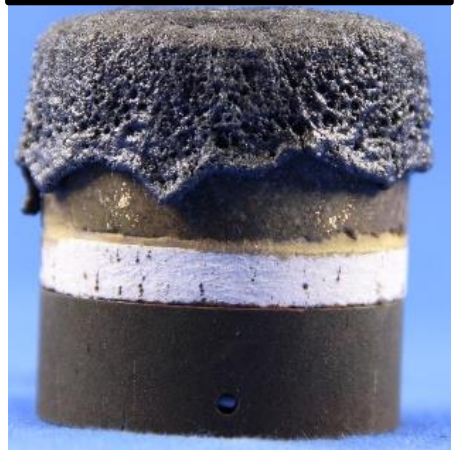
Basalt



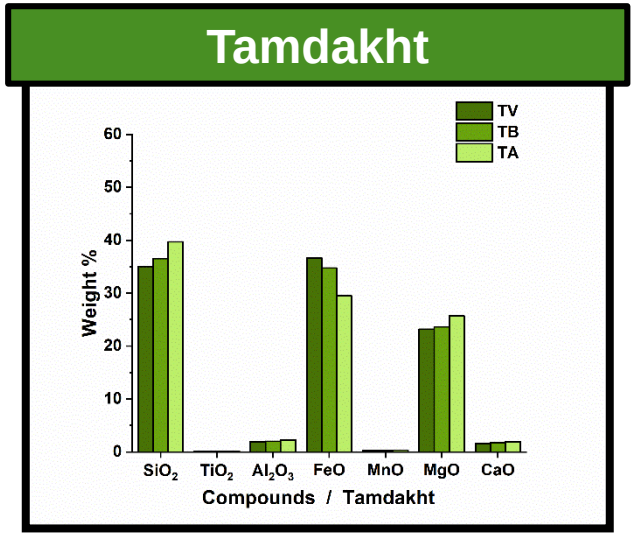
Basalt



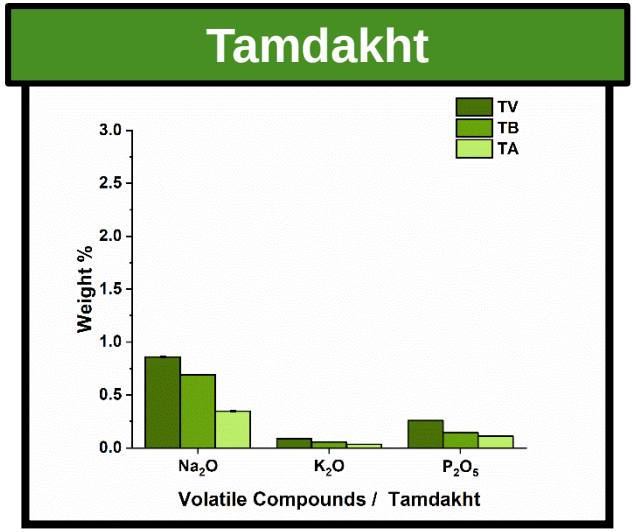
Tamdakht



Tamdakht



Tamdakht

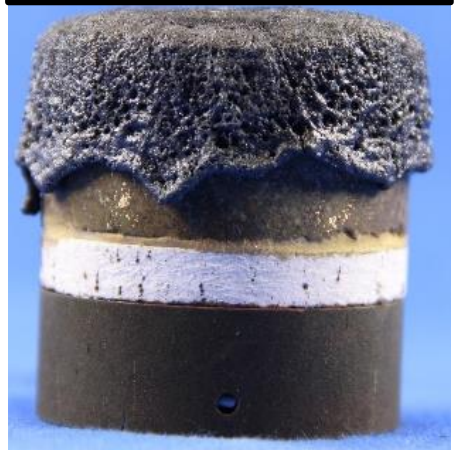


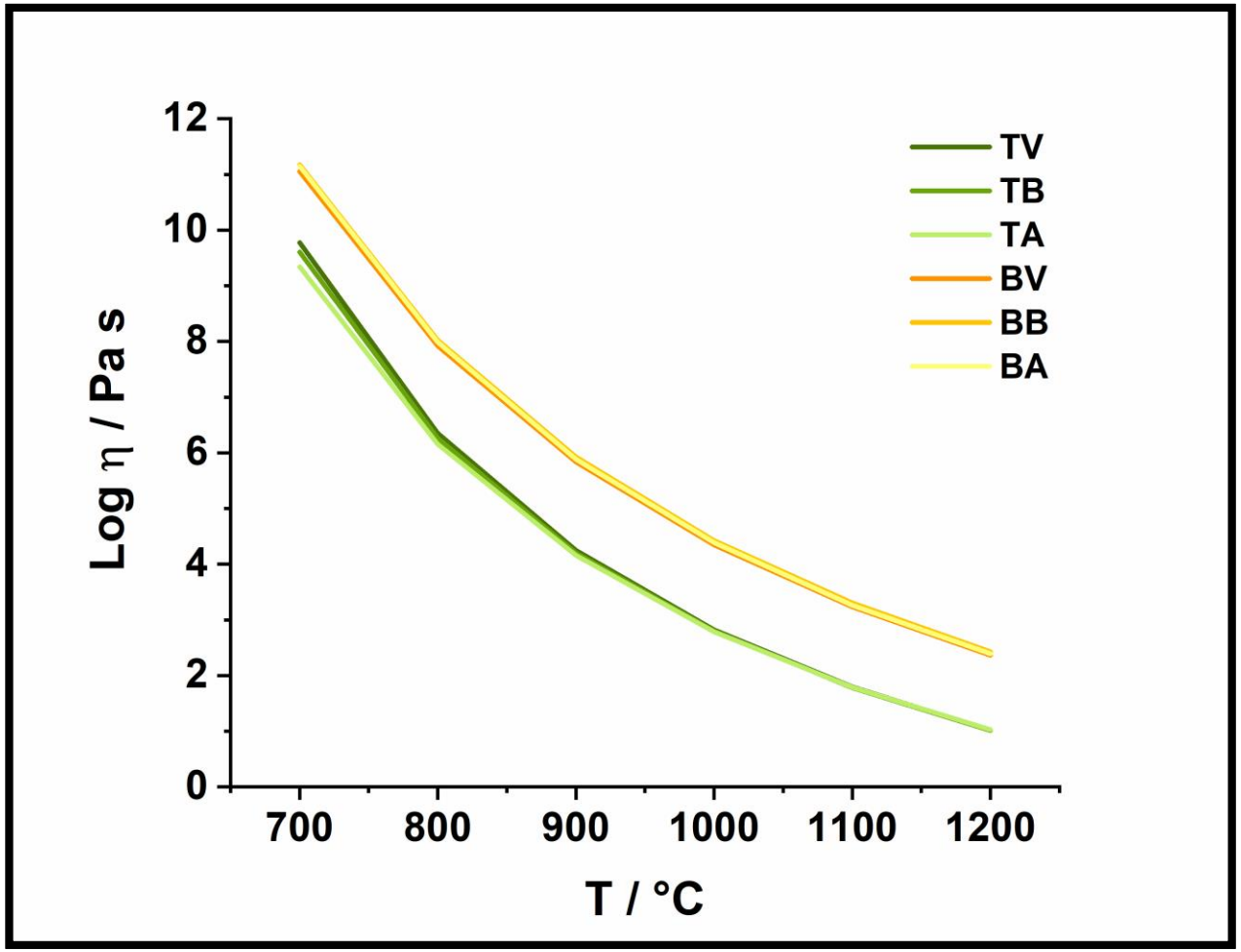
Melt Viscosity

Basalt



Tamdakht





Melt Viscosity Calculated Using Giordano Melt Model

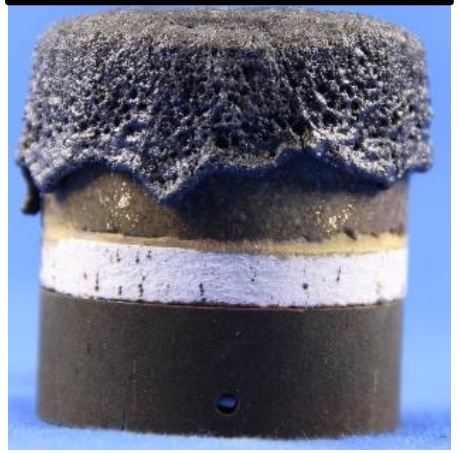
Giordano, D., Earth Planet. Sci. Lett. (2008)

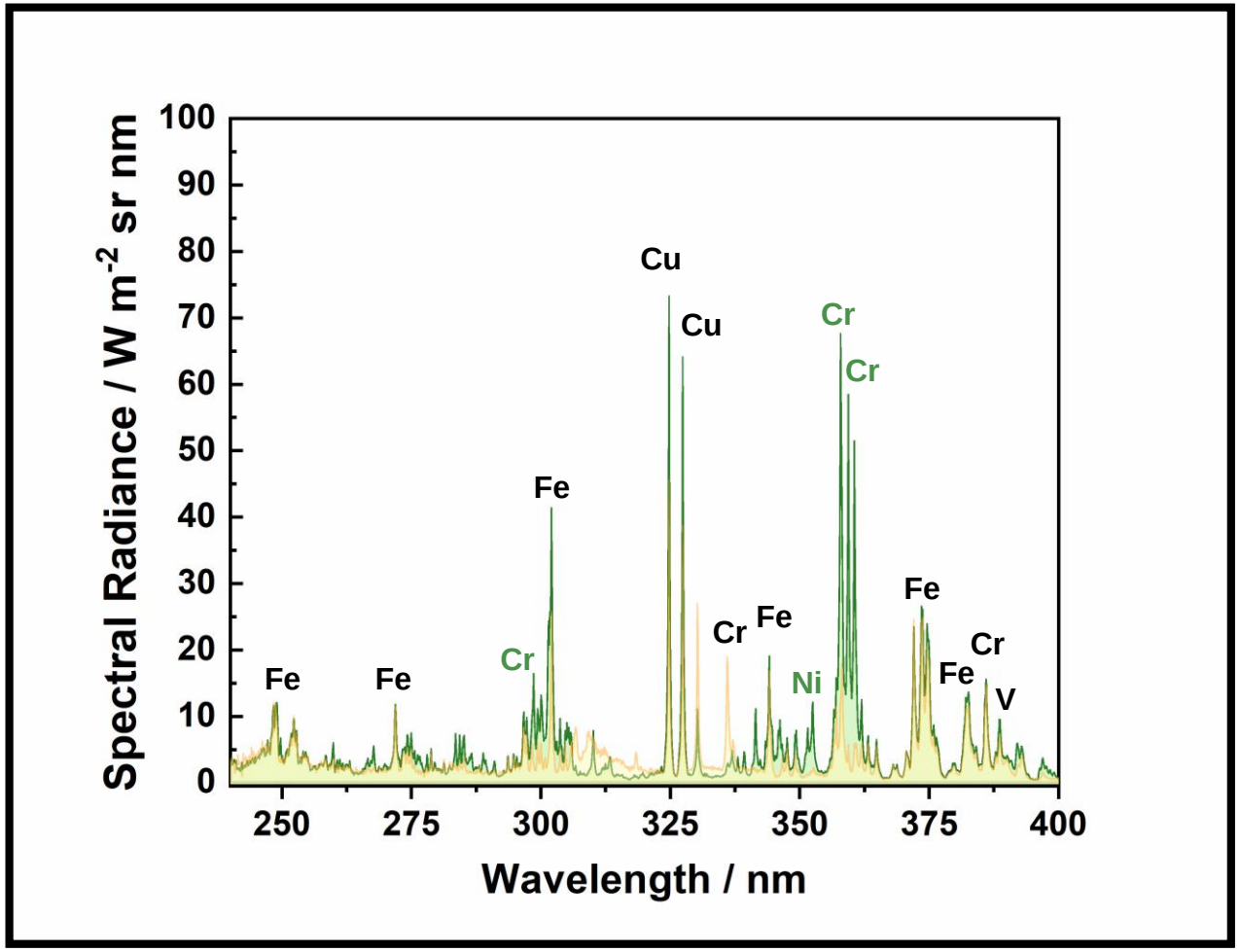
Melt Viscosity

Basalt



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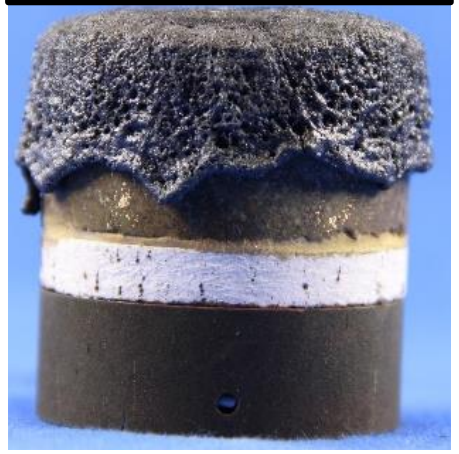


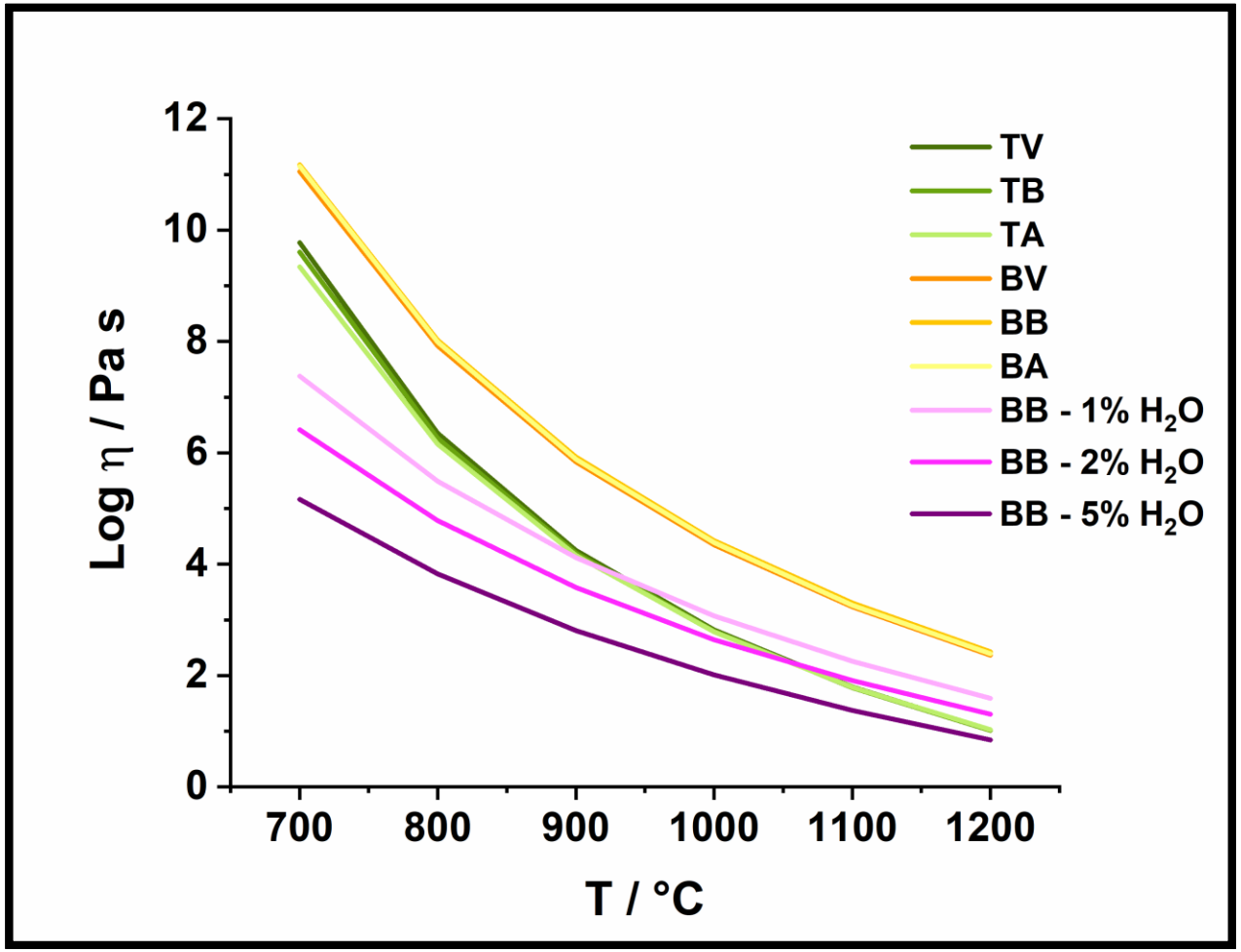
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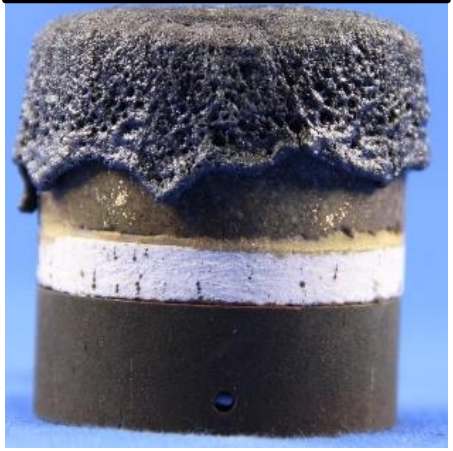
Giordano, D., Earth Planet. Sci. Lett. (2008)

Conclusions

Basalt



Tamdakht



- Recession rate and mass loss are significantly higher for basalt.
- Melt viscosity of basalt > Tamdakht.
- However, OH emission detected during basalt trial.
- Small quantities of H_2O can have a significant effect on melt viscosity.
- The presence of H_2O may compromise the integrity of the silicate network in the melt flow and lead to faster rates of mass loss or recession.
- Implications for Asteroid Threat Assessment?

THE END