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NETCASTPL4.0
- NETWORKING -

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The Potential of Solid Inorganic Foundry Binder

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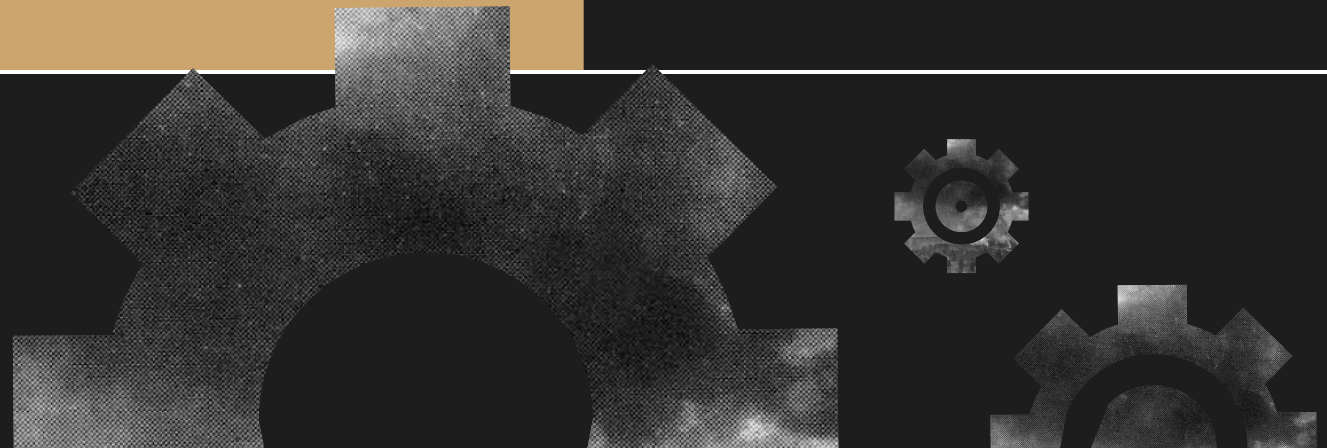
School of Engineering

Sustainable Sand Casting

- Harmful gases given off by organic binders.
- Renewed Interest in Inorganic sodium silicate binders.

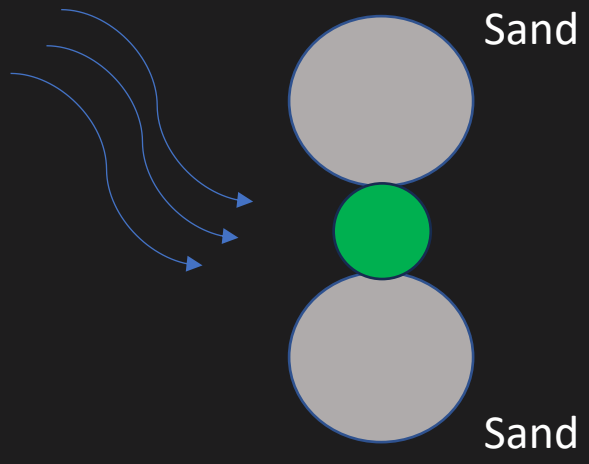


Worker Health Safety

Better Environment

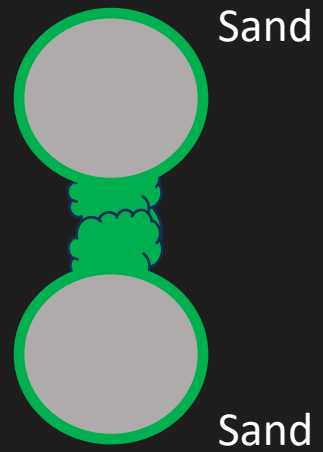
Economic Advantage

Binder Mechanism : Liquid binder



Inorganic Liquid

Binder Mechanism : Liquid binder

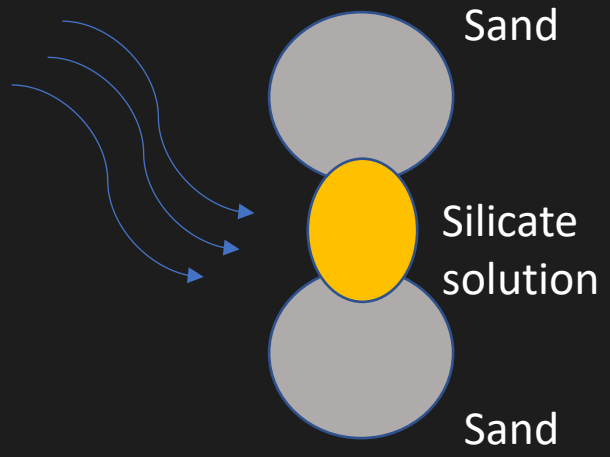


Inorganic Liquid

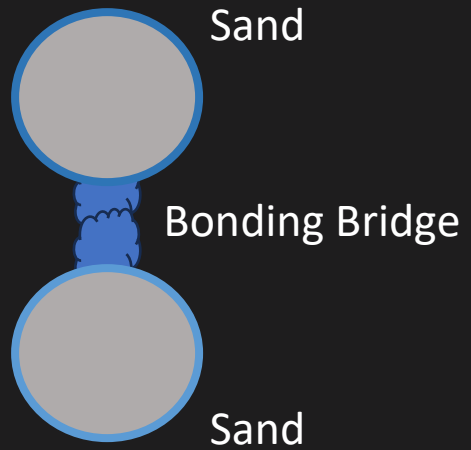
Binder Mechanism: Inorganic solid

Solid Silicate: 0.83% of sand
Water: 1.17% of sand

Binder Mechanism: Inorganic solid



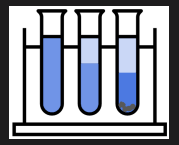
Binder Mechanism: Inorganic solid



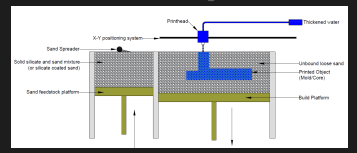
Rationale: Why solid inorganic binder?

Transport

Use and storage



Sand printing



Two-part phenolic binder system

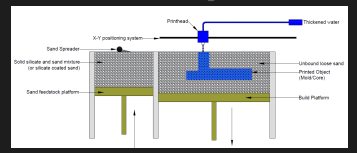
Inorganic solid (solid silicate)

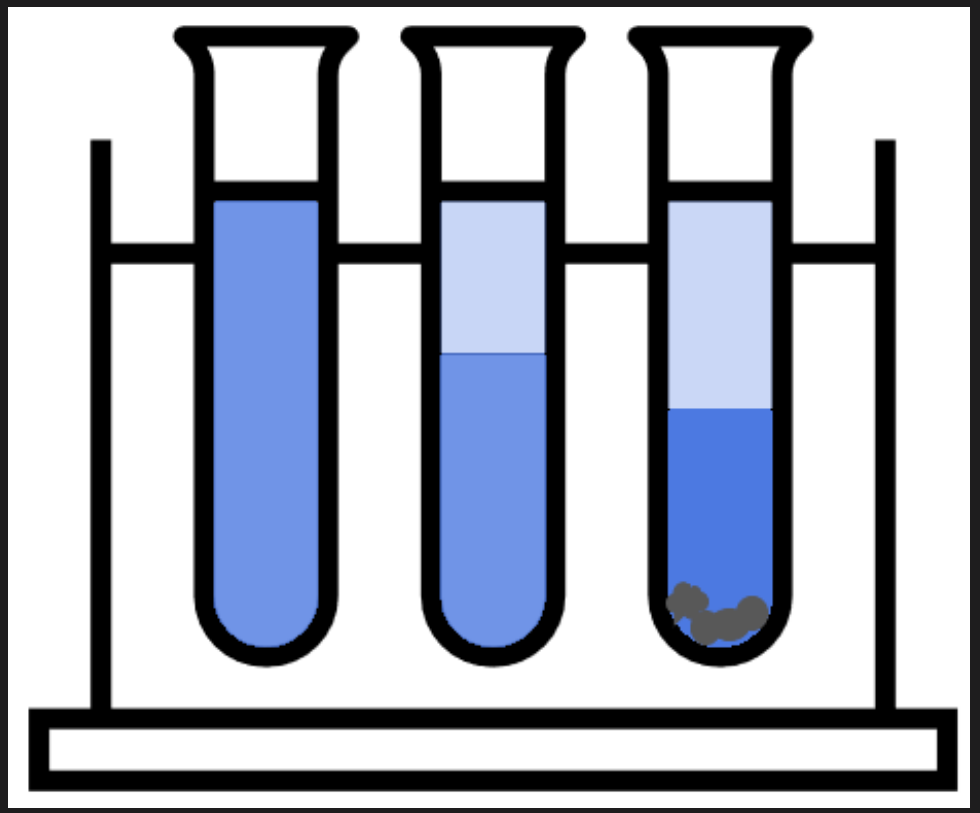
Rationale: Why solid inorganic binder?

Transport

Use and storage

Sand printing





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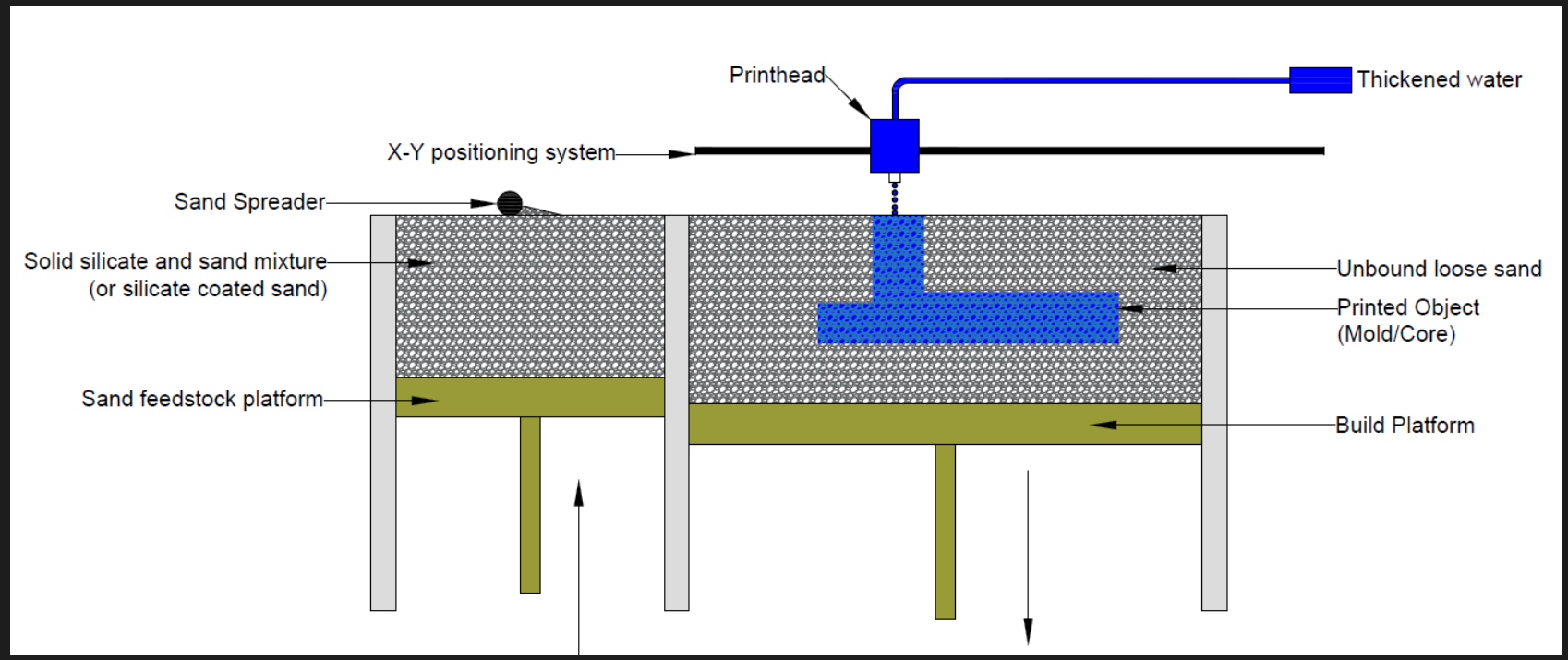
Binder separation, lump formation etc.

Rationale: Why solid inorganic binder?

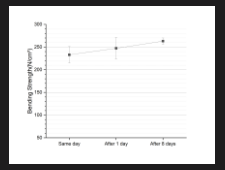
Transport

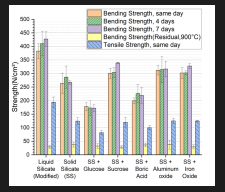
Use and storage

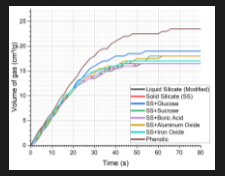
Sand printing

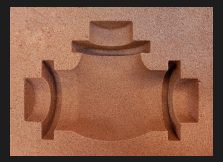


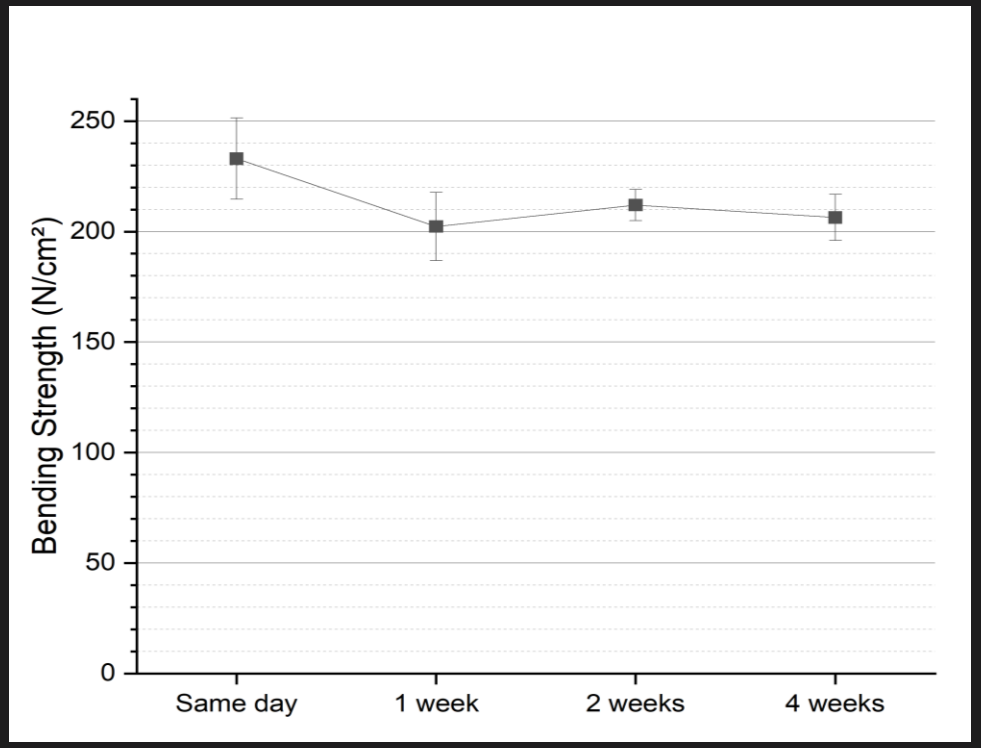
The good, the great!



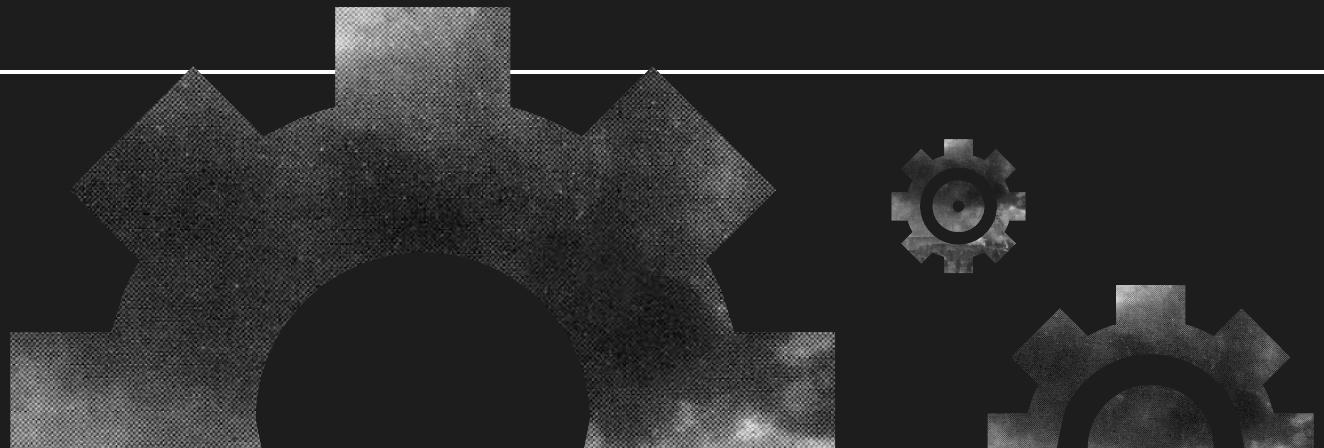




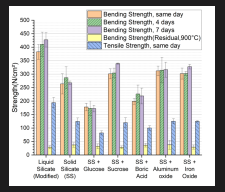


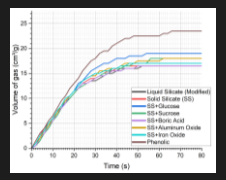


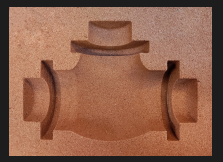
Silica and solid silicate stored as a mixture in closed containers

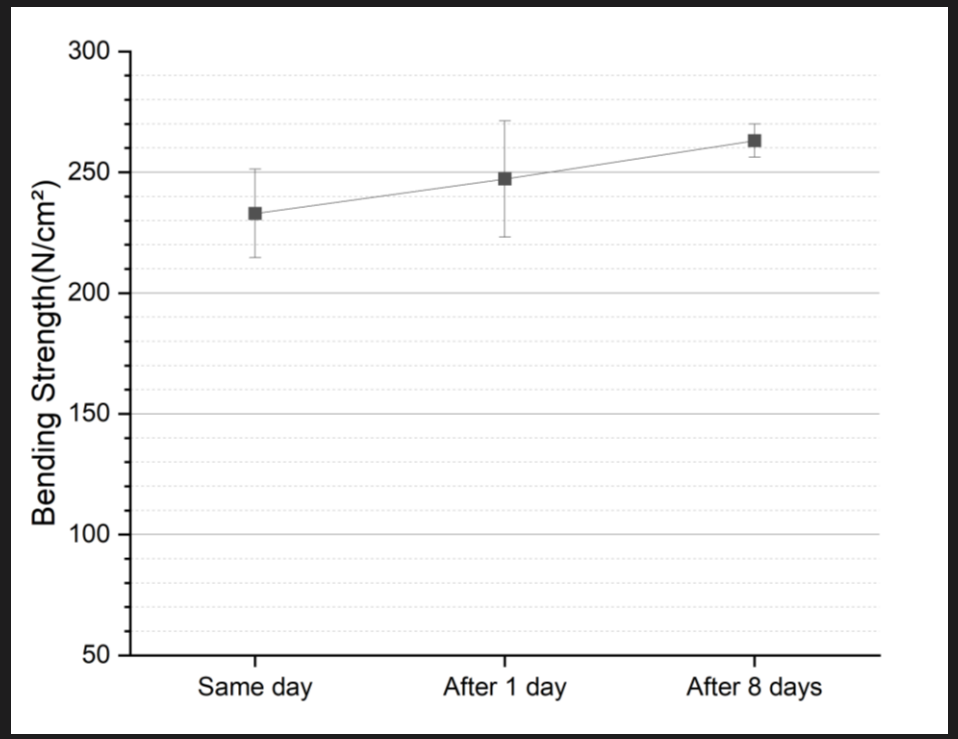


The good, the great!





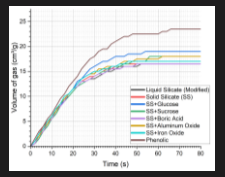


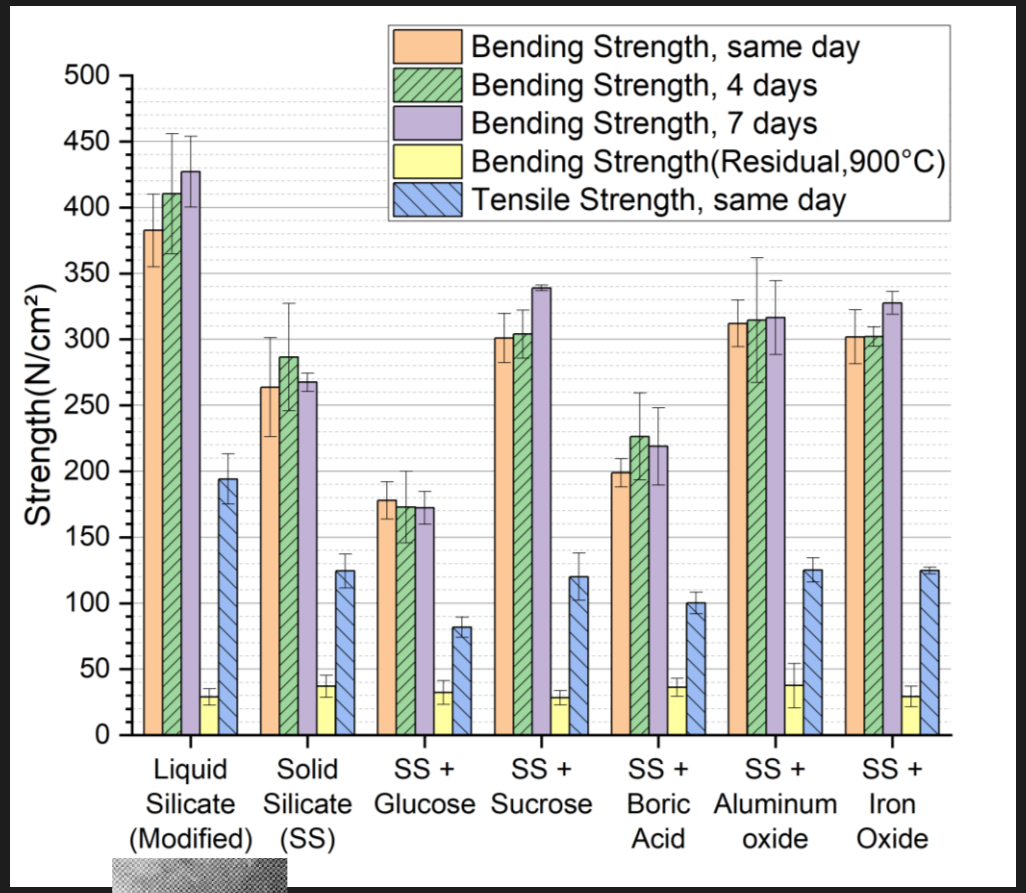


Silica and solid silicate stored as a mixture in a container open to air

A!

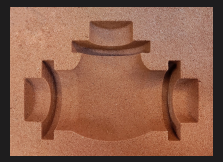
The good, the great!

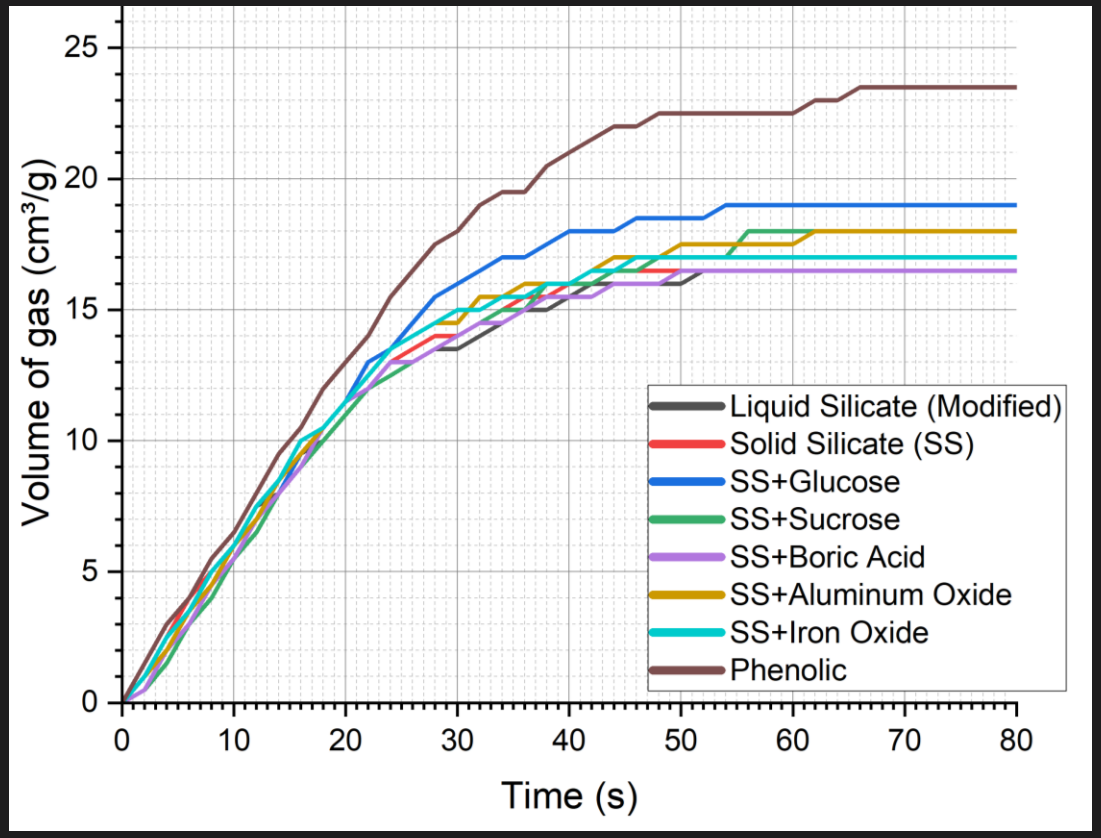




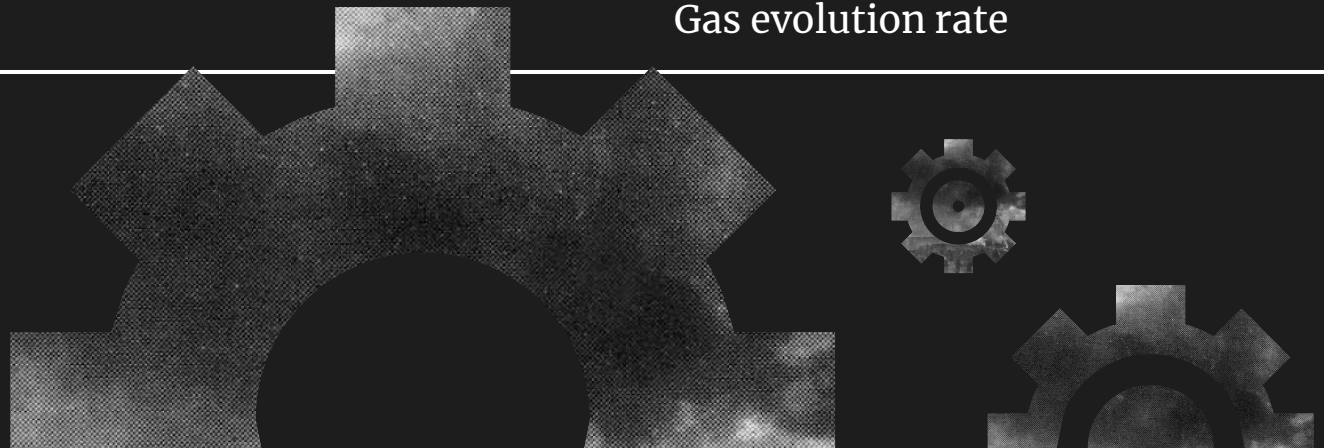
Strength level of liquid silicate, solid silicates and solid silicate modified with different additives

The good, the great!





Gas evolution rate



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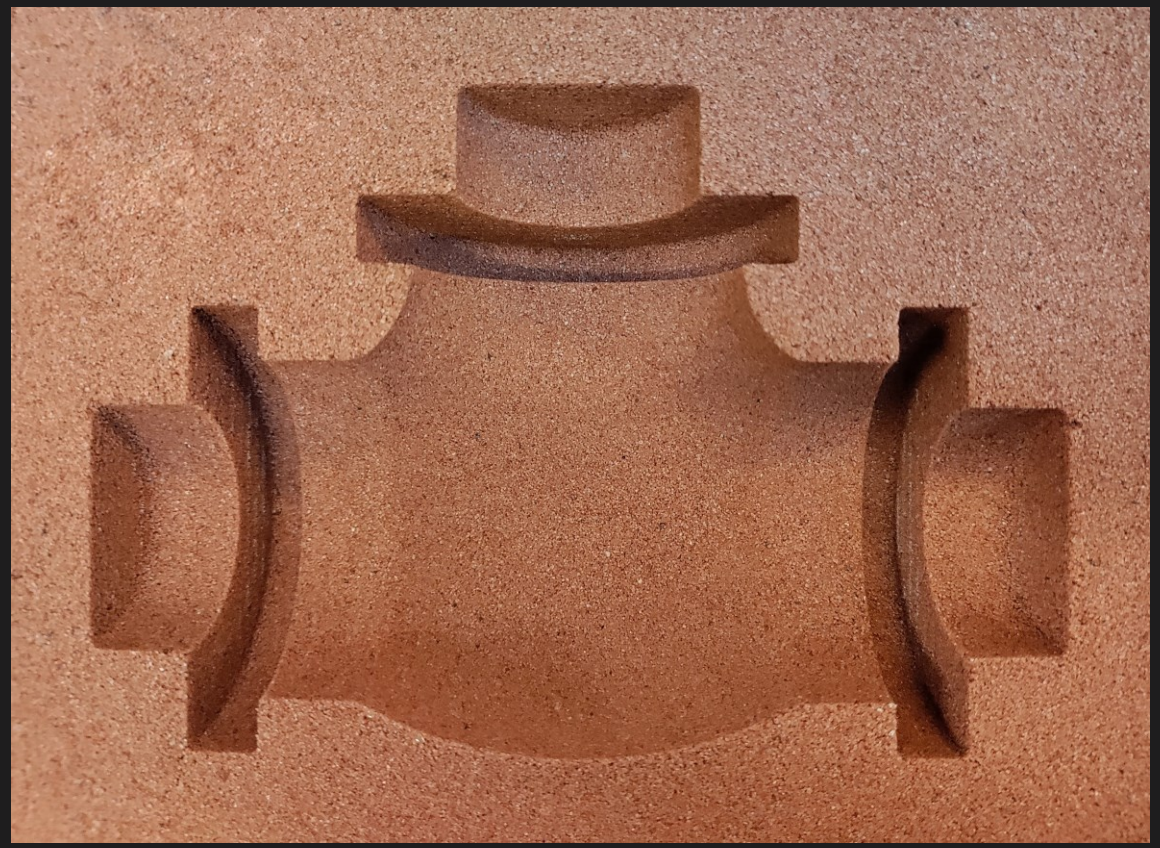
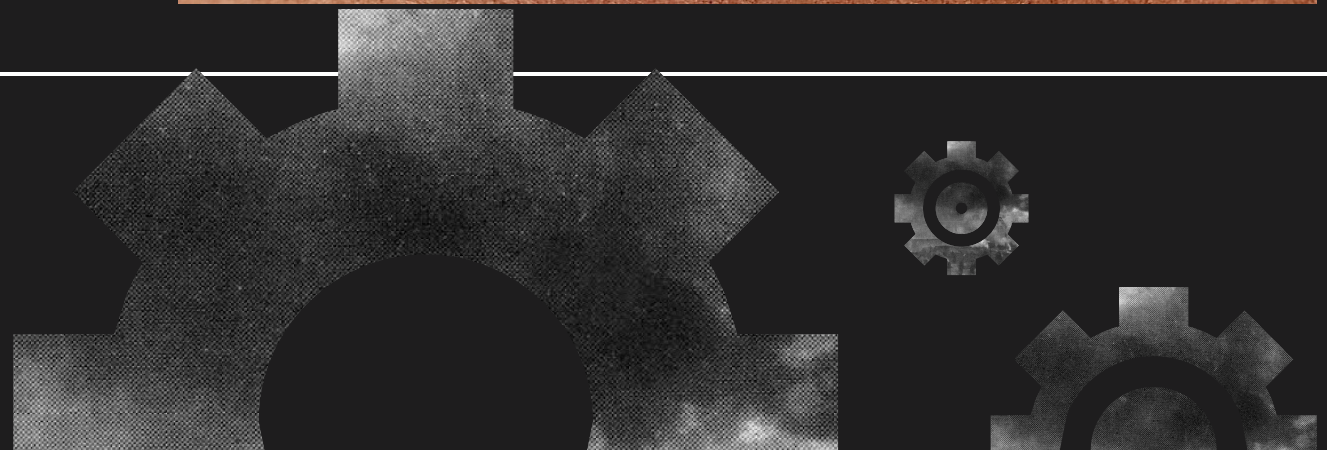
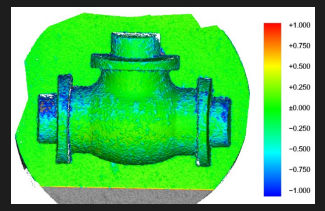
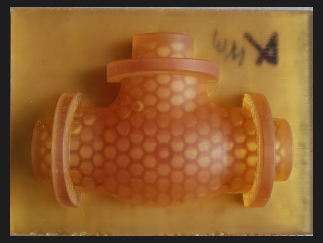


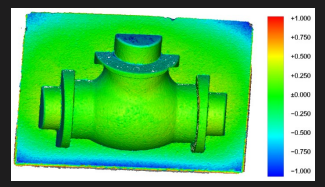
Mold made with silica, solid silicate and iron oxide additive

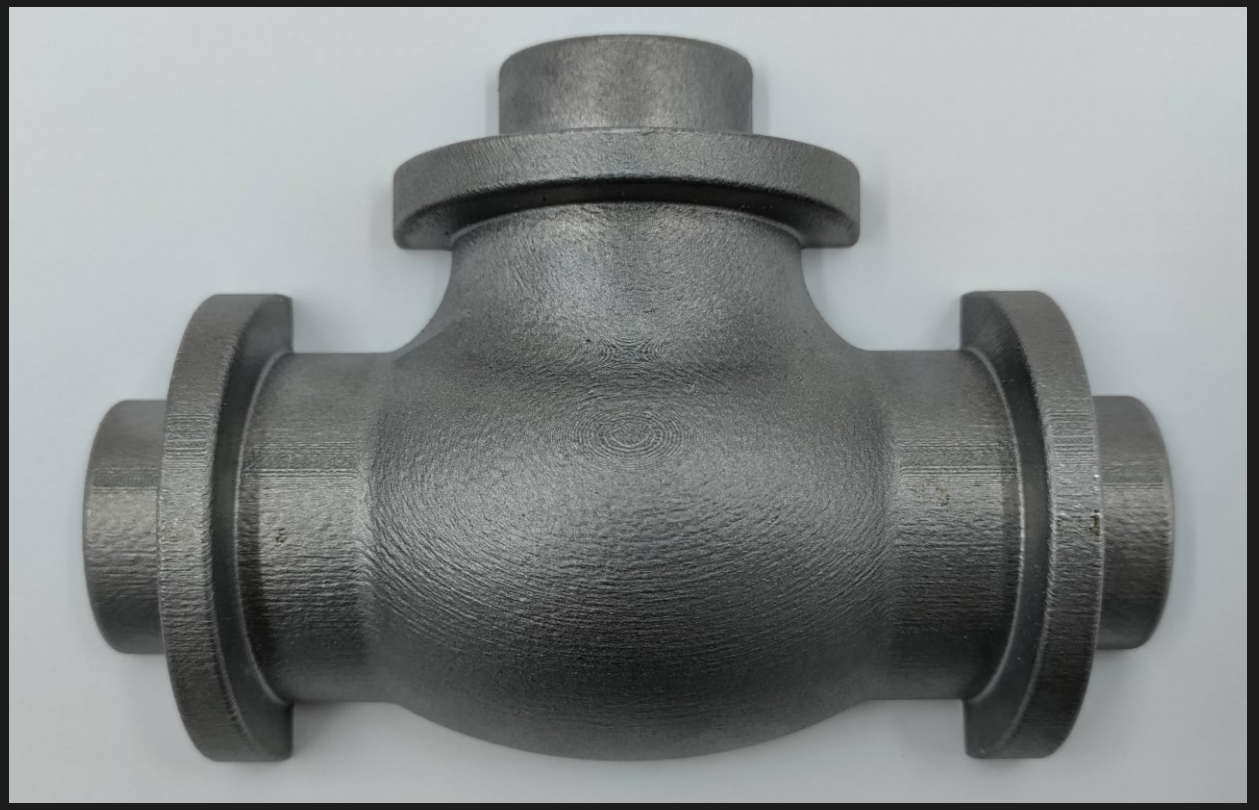


Challenges and Remedies



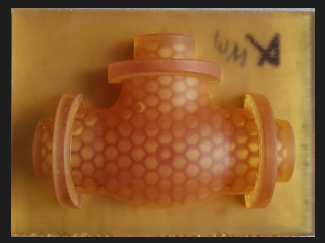


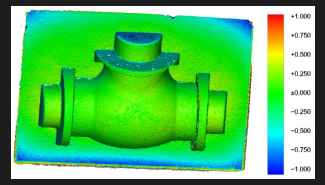


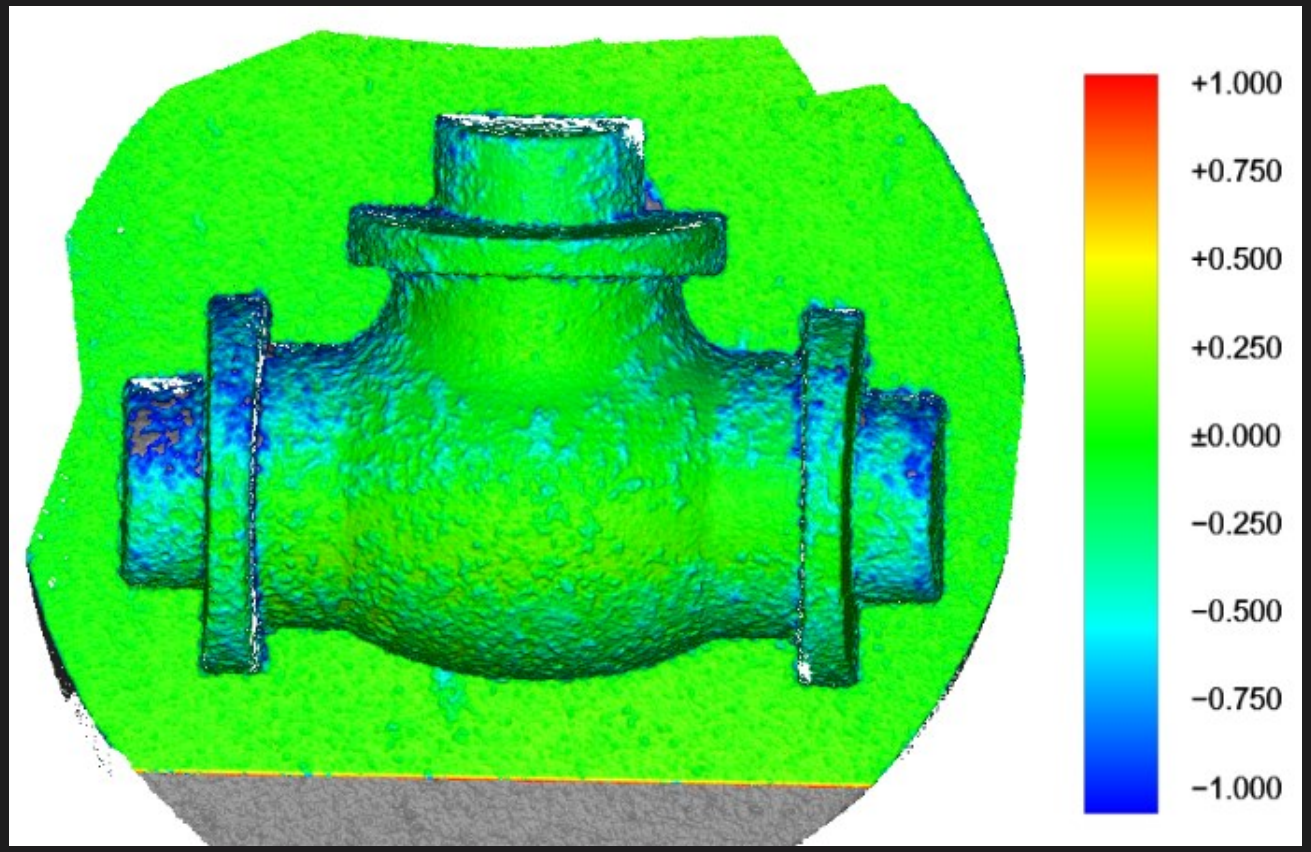


Aluminum Pattern

Challenges and Remedies

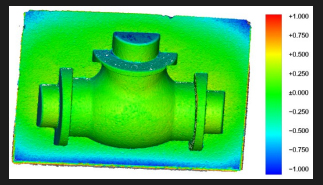


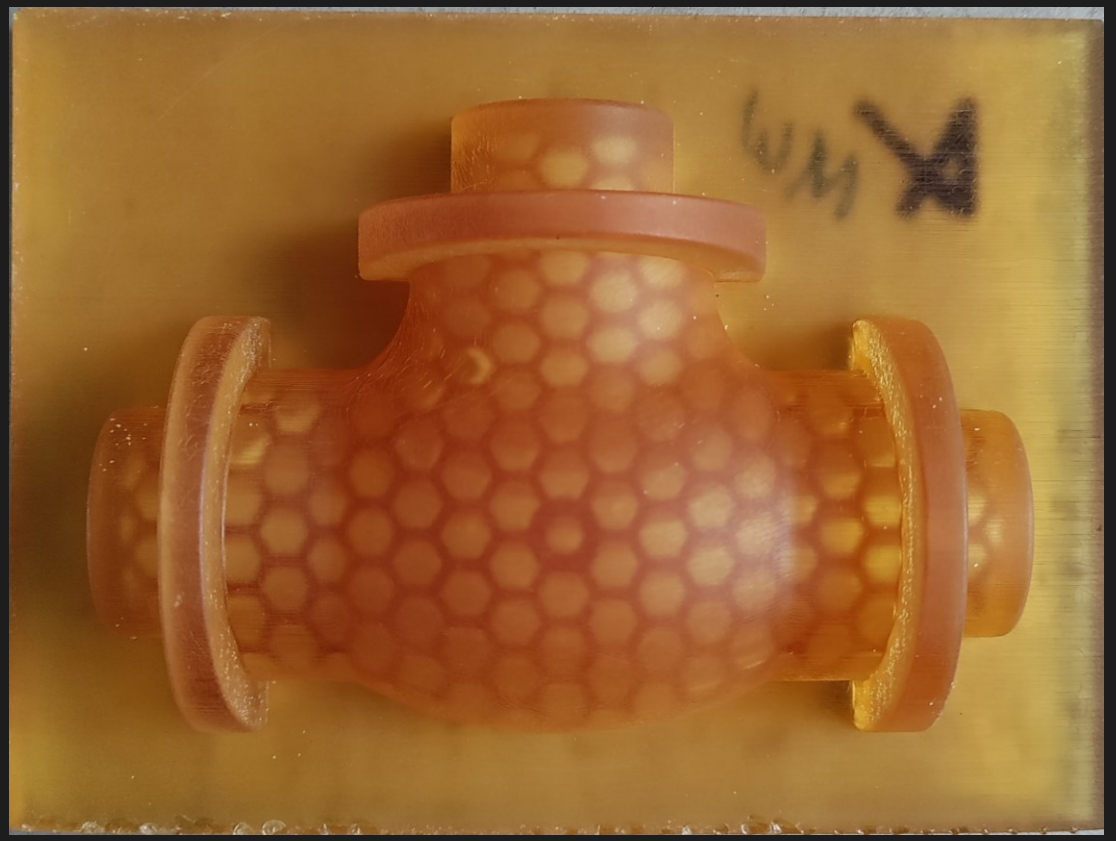




3D scan of a mold made with aluminum pattern

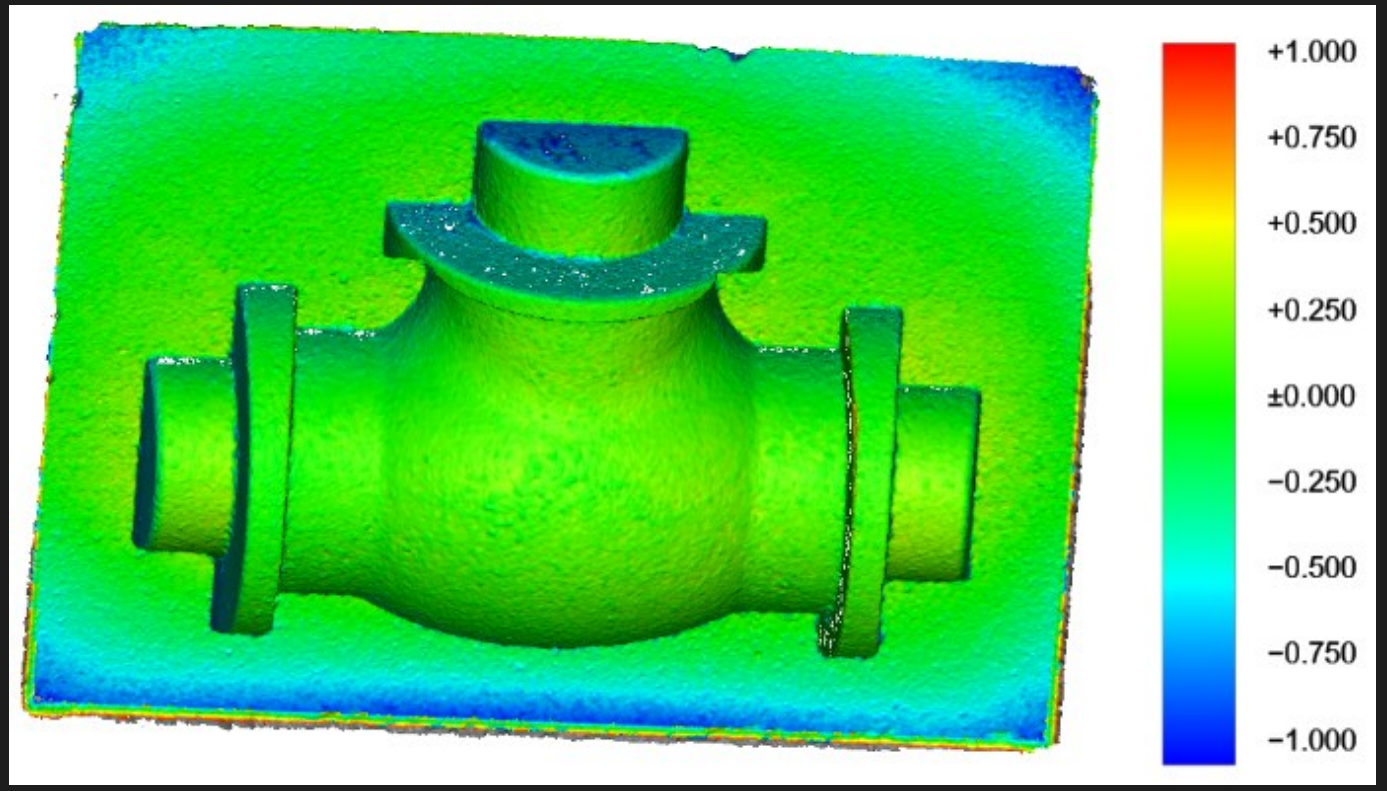
Challenges and Remedies





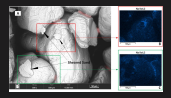
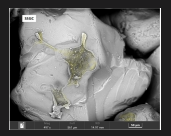
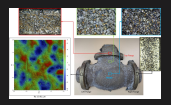
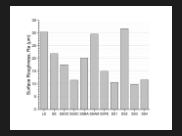
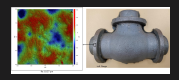
3D printed (SLA) pattern
with a heat resistant resin

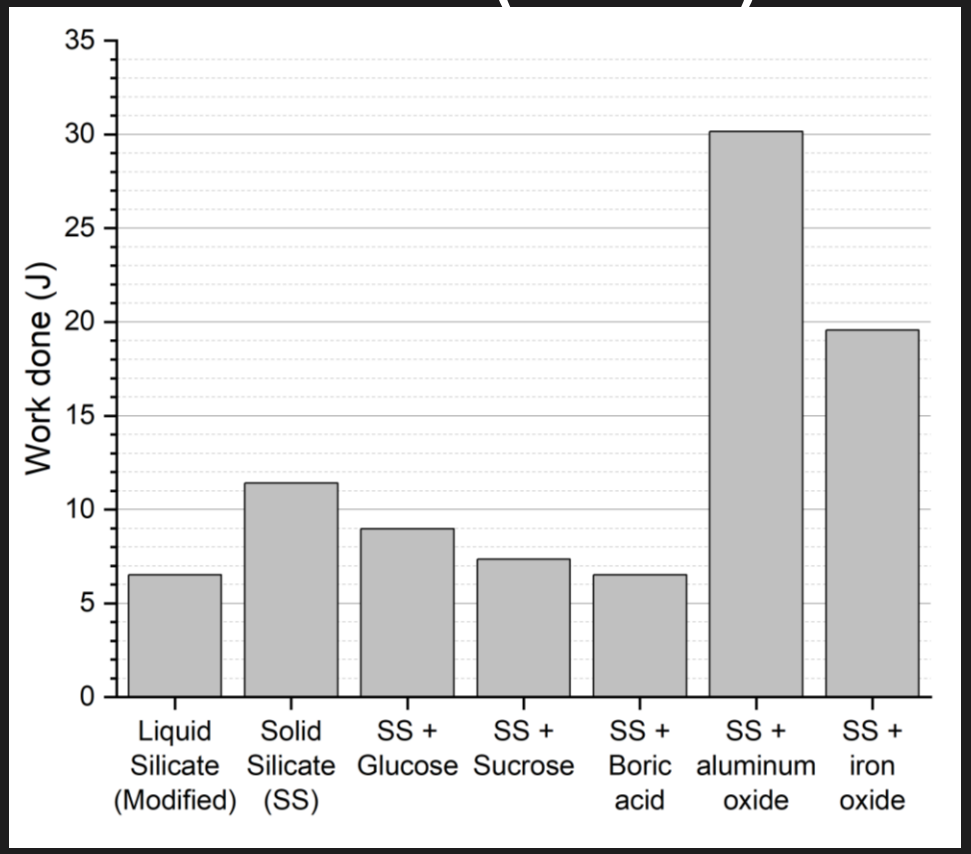
Challenges and Remedies



3D scan of a mold made with heat resistant plastic pattern

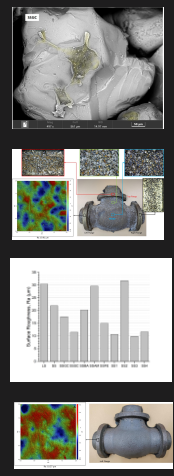
Challenges and Remedies (cont.)

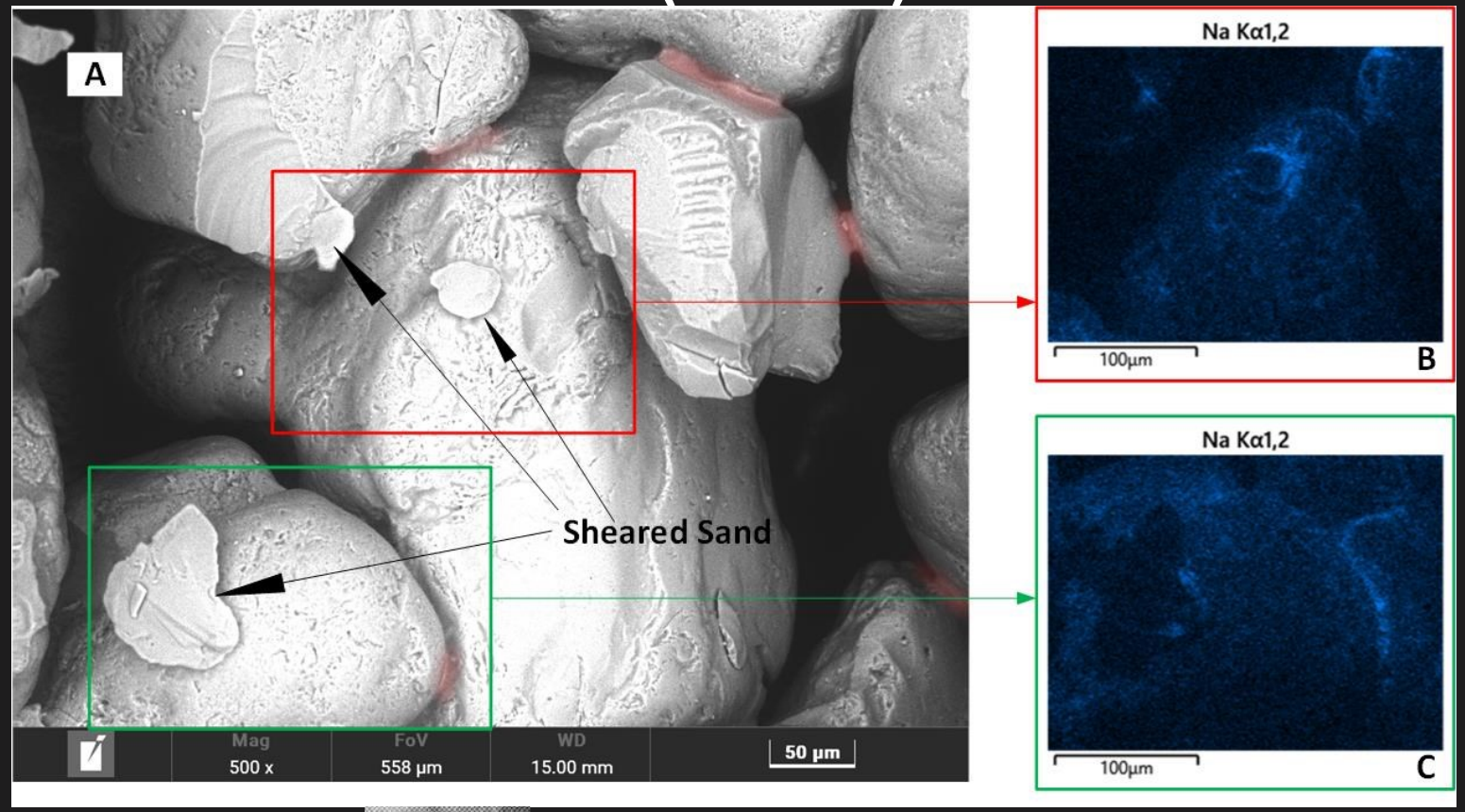








Collapsibility test

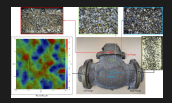
Challenges and Remedies (cont.)

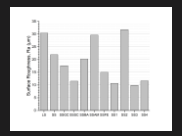


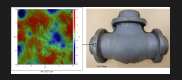


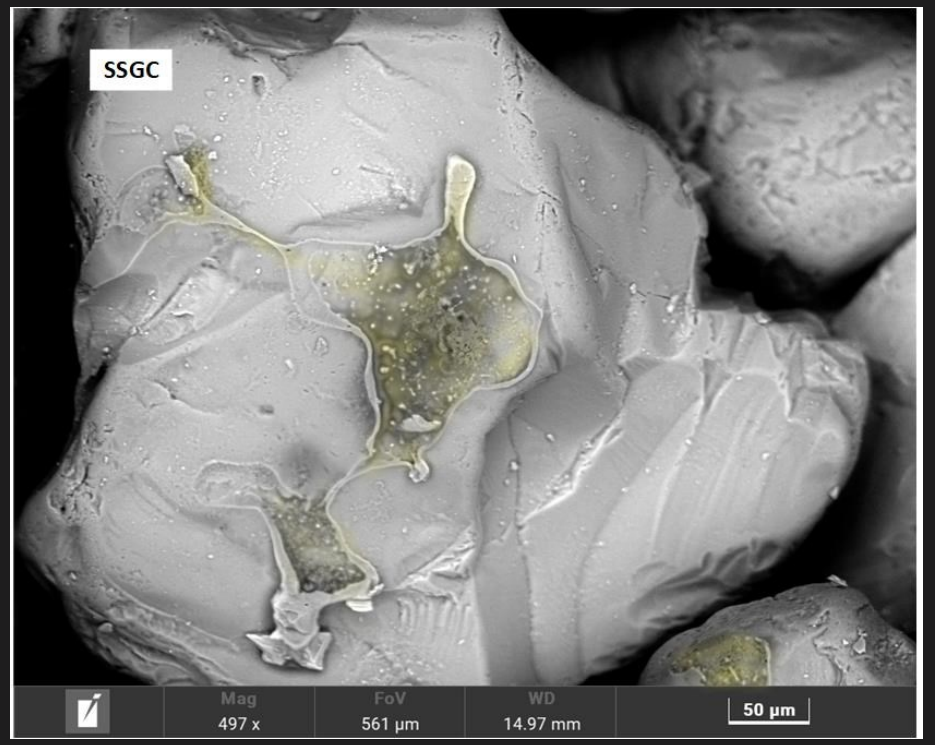
SEM Fracture analysis, solid silicate, no additive

Challenges and Remedies (cont.)

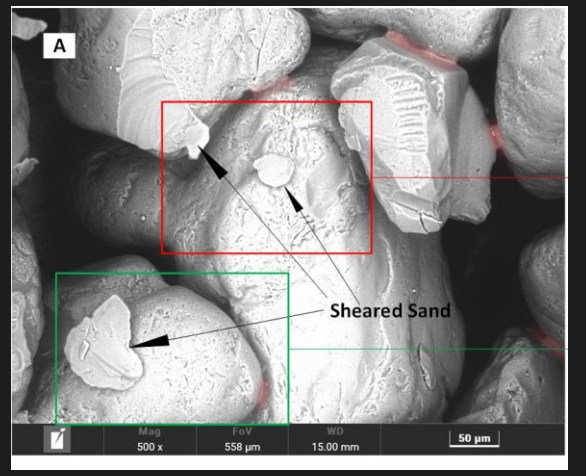




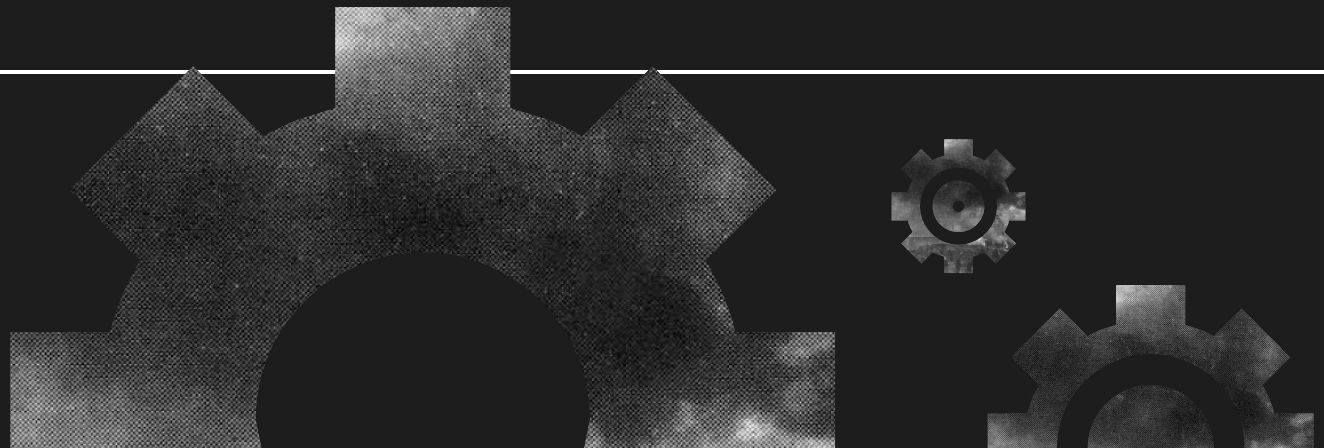




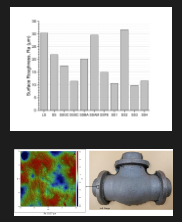
SEM fracture analysis, Glucose additive

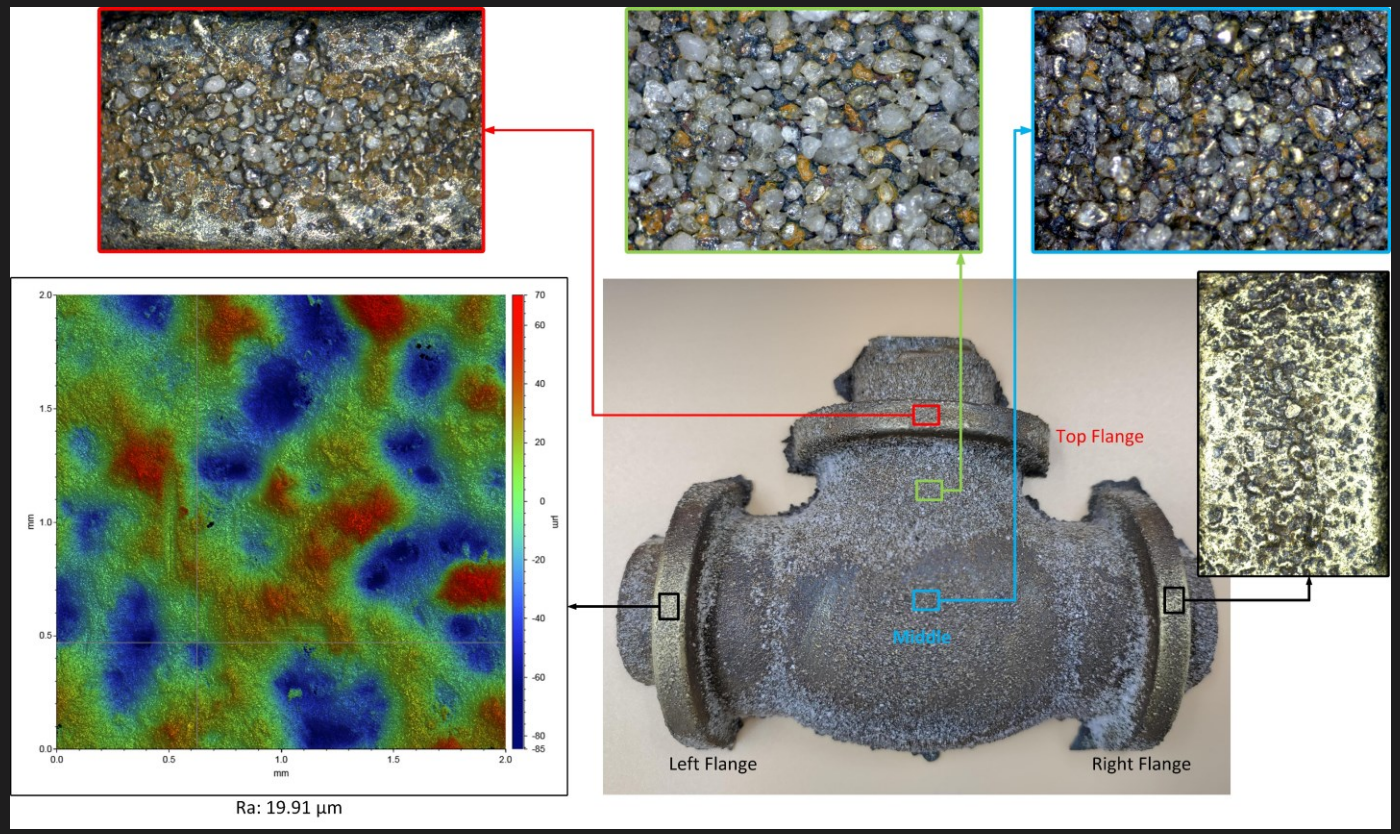


SEM Fracture analysis, solid silicate, no additive



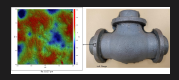
Challenges and Remedies (cont.)

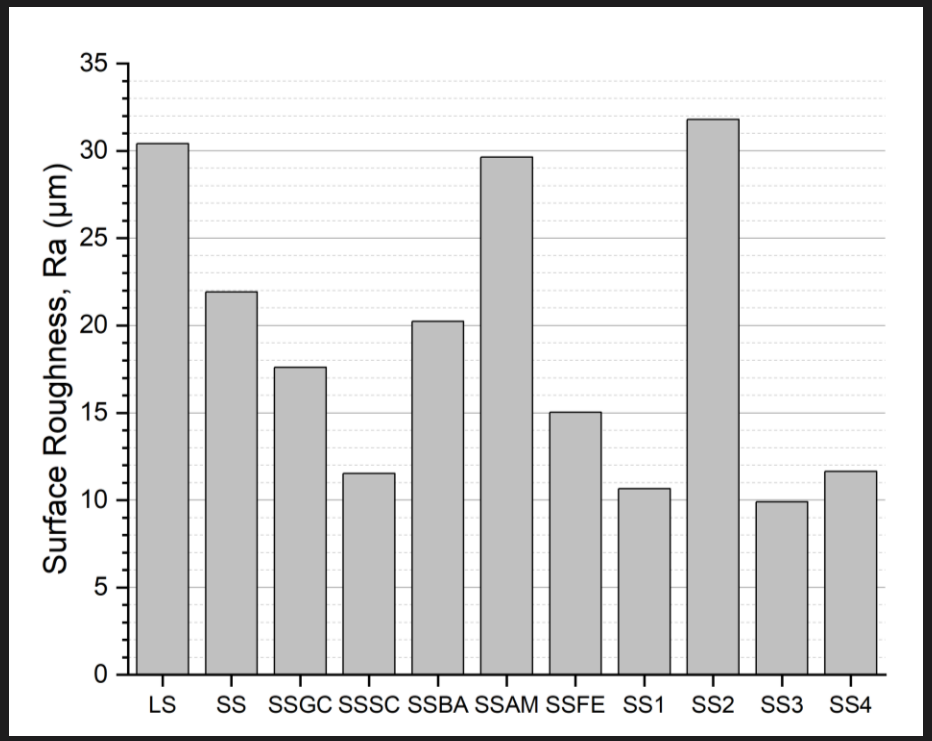




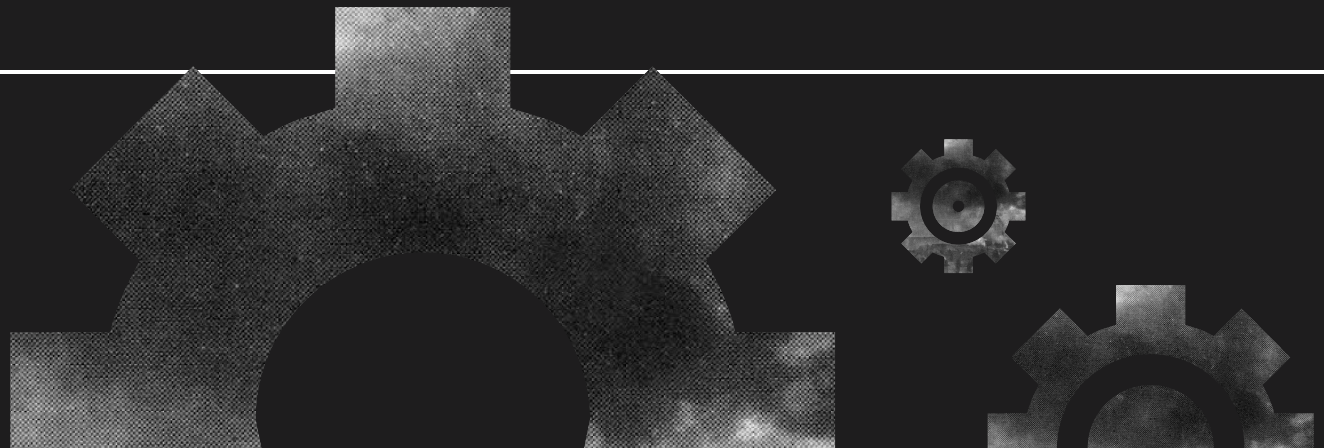
Cast Analysis

Challenges and Remedies (cont.)

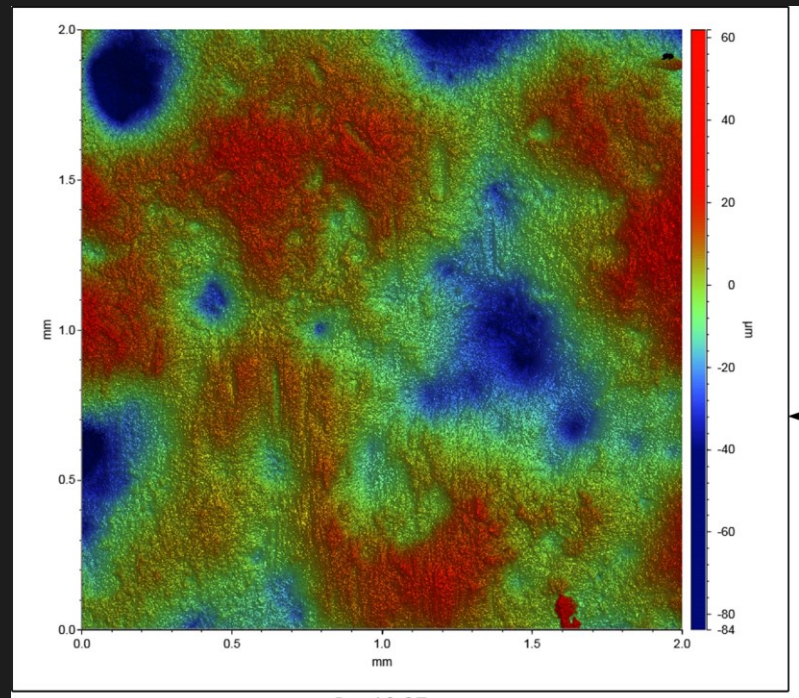




Surface roughness of grey cast iron



Challenges and Remedies (cont.)



Ra: 10.27 µm

Grey cast iron, with graphite coating

Reflections

Summary

Coming up

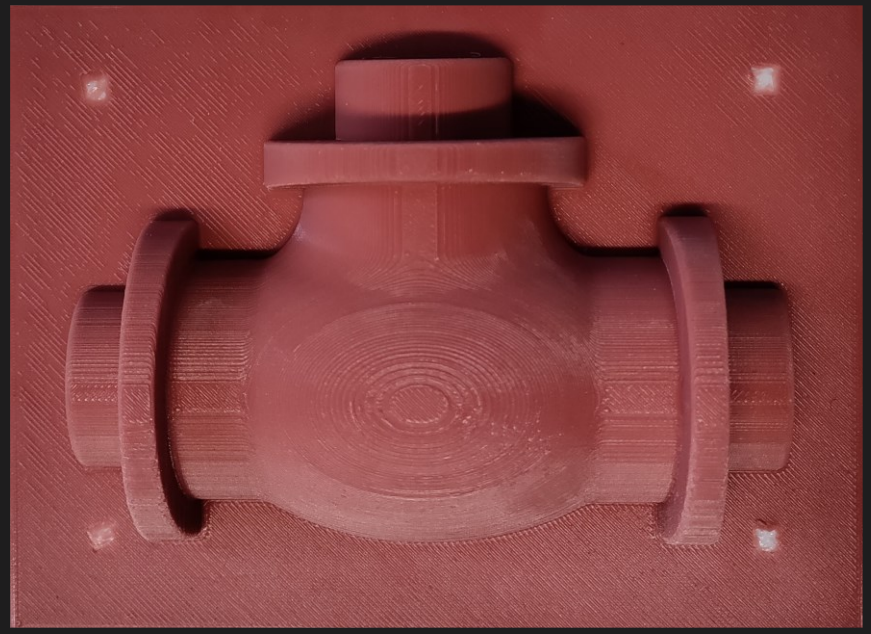
- Less weight
- Good storage
- Promising molding and casting trial conducted
- Good surface roughness demonstrated
- Additives’ effect identified to improve collapsibility
- Great potential to be the norm of sustainable foundry binders

Reflections

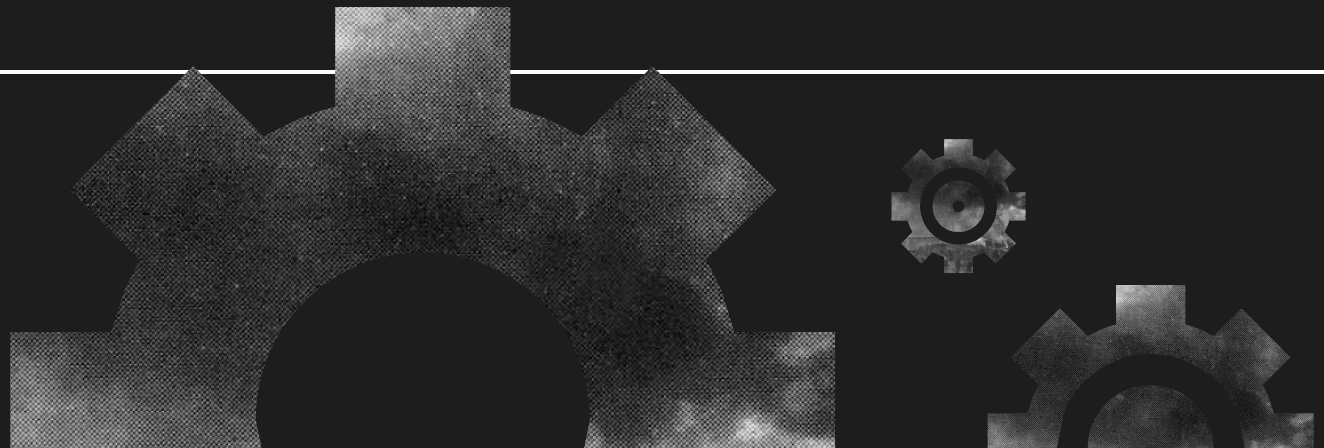
Summary

Coming up

Shell molding



Other microwave compatible pattern material



Thank You!

Questions?

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