

Research and Development on the modification of pattern wax surface hydrophilicity



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Wax for investment casting

- Wax is generally hydrophobic
- Wax need specific physical properties
- Wax needs consistent performance

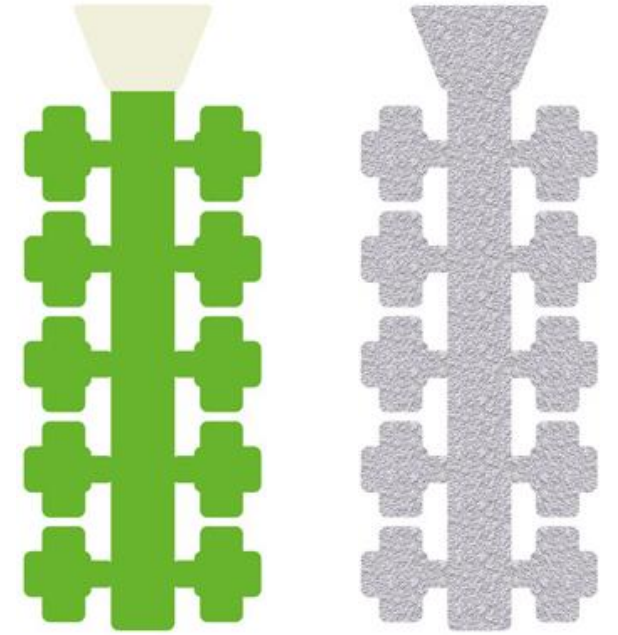


What this is about?

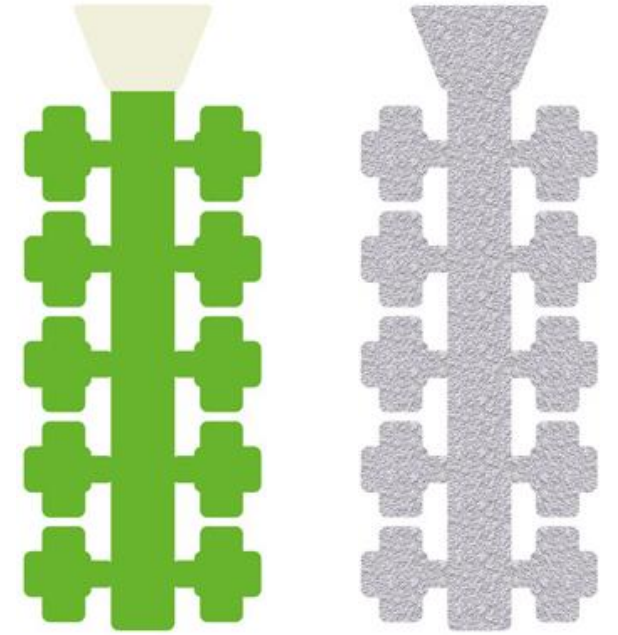
- Shell adhesion to pattern wax
- Improved pattern wax surface to improve yield

How?

1. Modifying wax formulation
2. Wax Surface modification

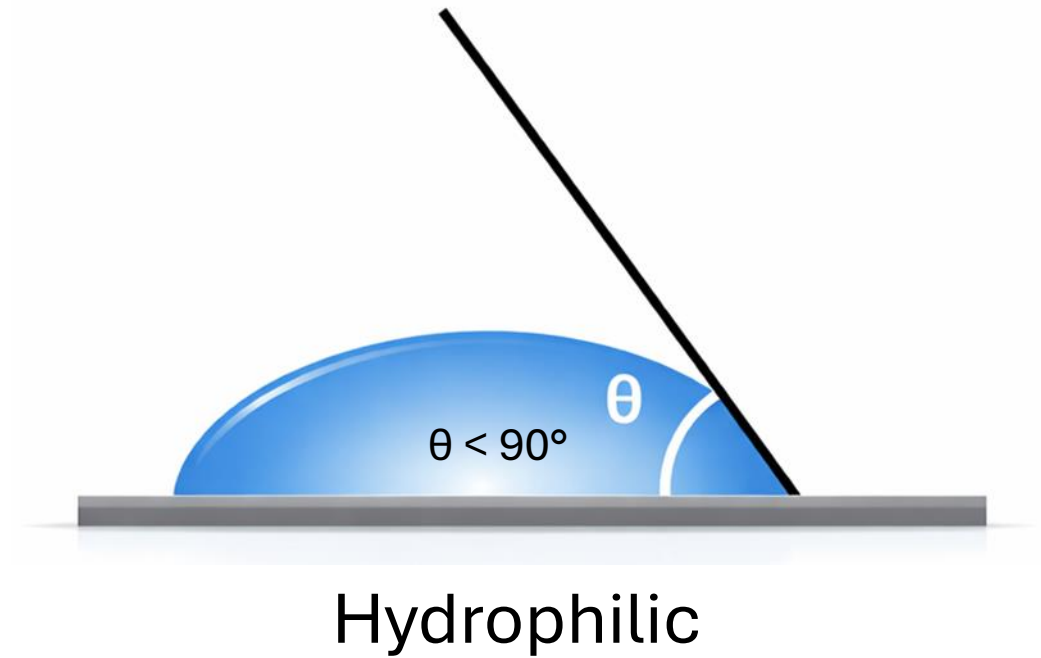
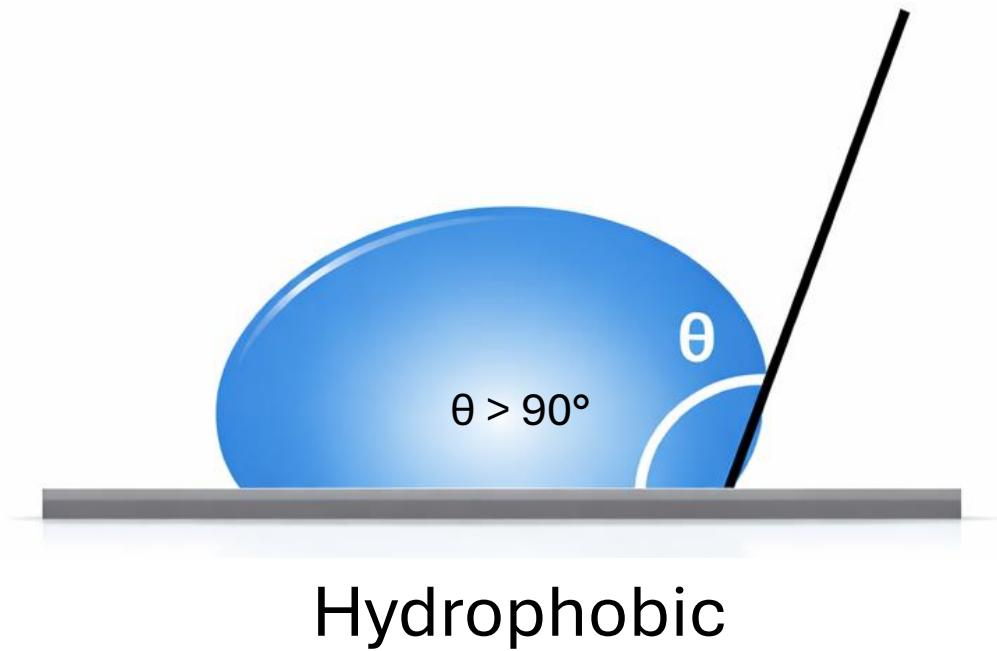


Wax Surface modification



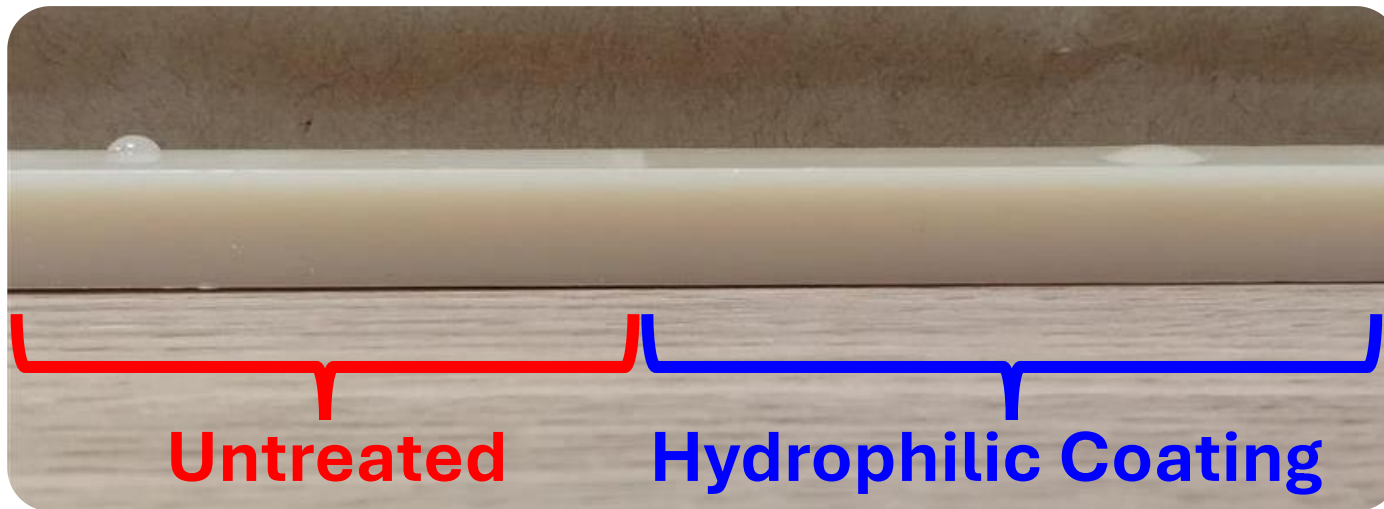
How to verify surface modification?

Water Contact Angle (WCA) measurements



Wax surface modification

- A new hydrophilic surface coating was developed
- The coating increases the surface energy and improves wettability
- Hydrophilic behaviour of the wax surface



Wax tested

- Filled Pattern wax



- Straight unfilled wax



- Reconstituted filled wax



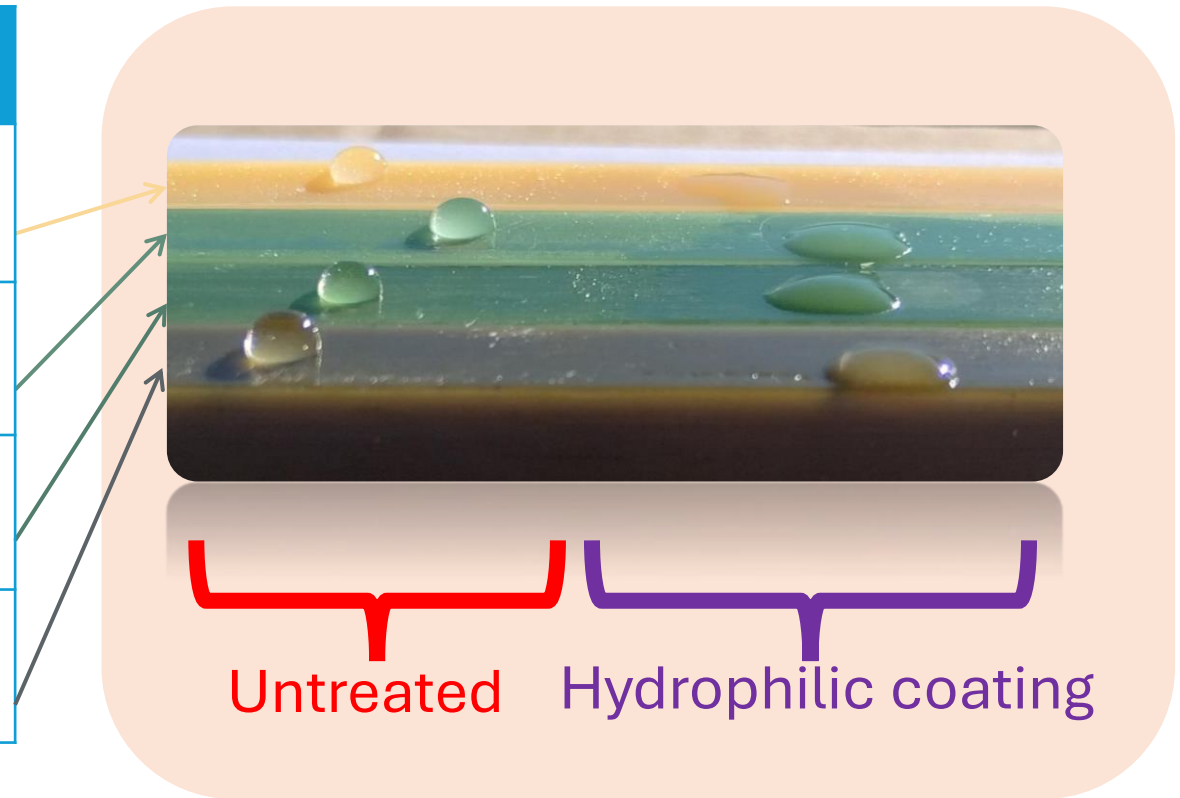
- Reclaimed unfilled wax



Water Contact Angle results

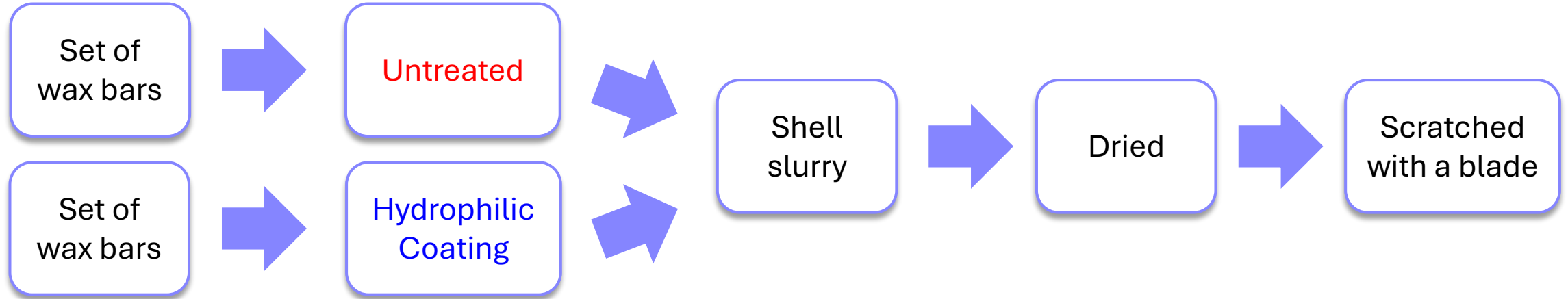
- Coated waxes show significant more hydrophilic behaviour

Wax type	Untreated	Coated
Filled pattern wax	102°	20°
Straight wax	92°	44°
Reconstituted wax	95°	36°
Reclaimed wax	100°	40°



WCA calculated using a Tantec contact angle meter

Scratch test



Scratch test

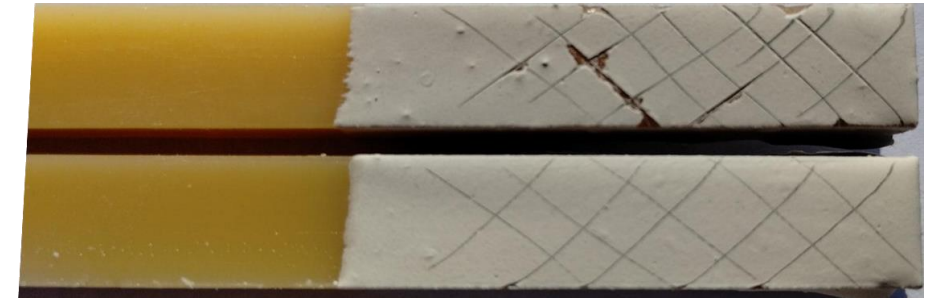
- Coated and Uncoated wax bars were immersed in a shell slurry
- Scratched with a sharp blade once dried

Results:

- Coated bars show better adhesion to shell
- Better dripping line

Uncoated Filled
Pattern wax

Coated Filled
Pattern wax



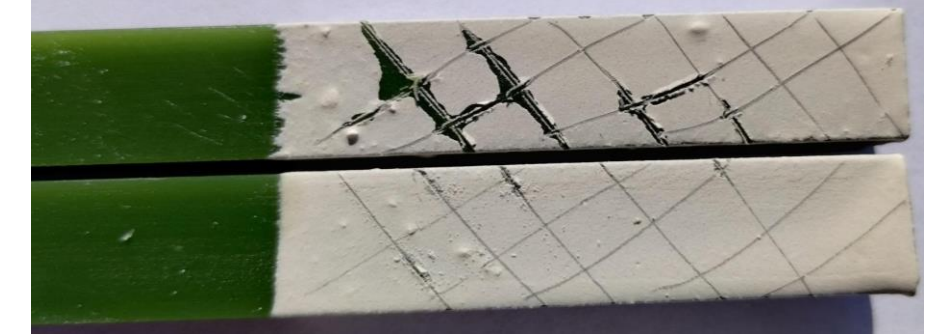
Uncoated Straight wax

Coated Straight wax



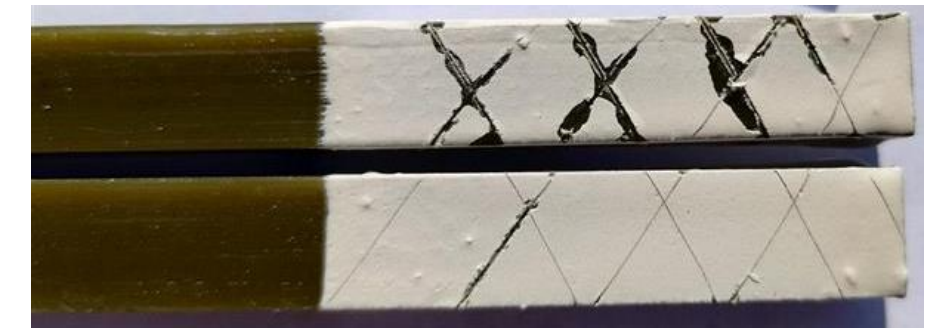
Uncoated Filled
Reconstituted wax

Coated Filled
Reconstituted wax



Uncoated Unfilled
Reclaimed wax

Coated Unfilled
Reclaimed wax

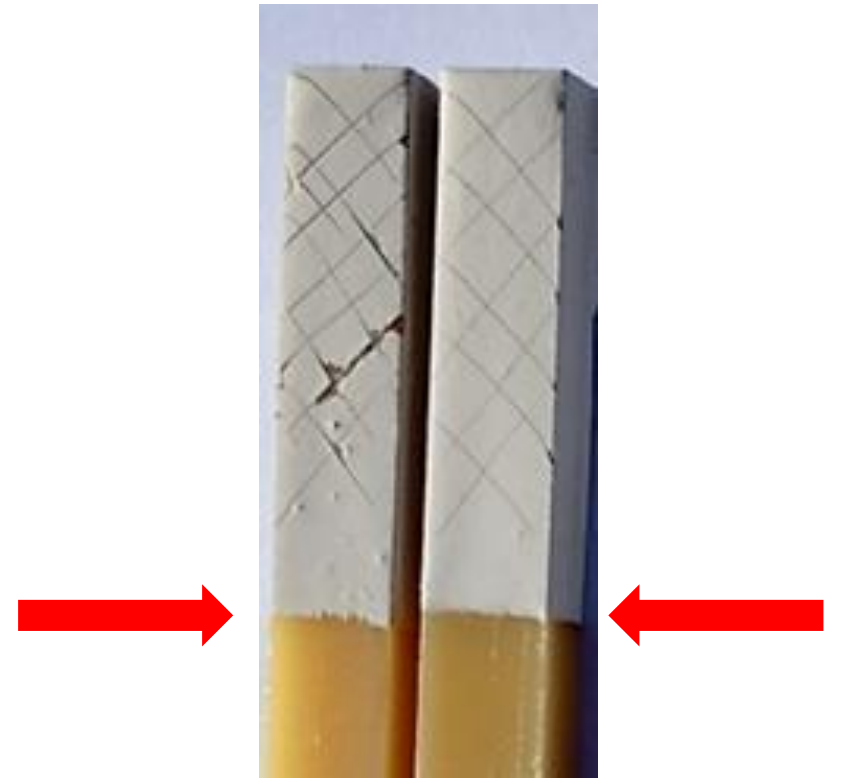


Scratch test

- Coated and Uncoated wax bars were immersed in a shell slurry
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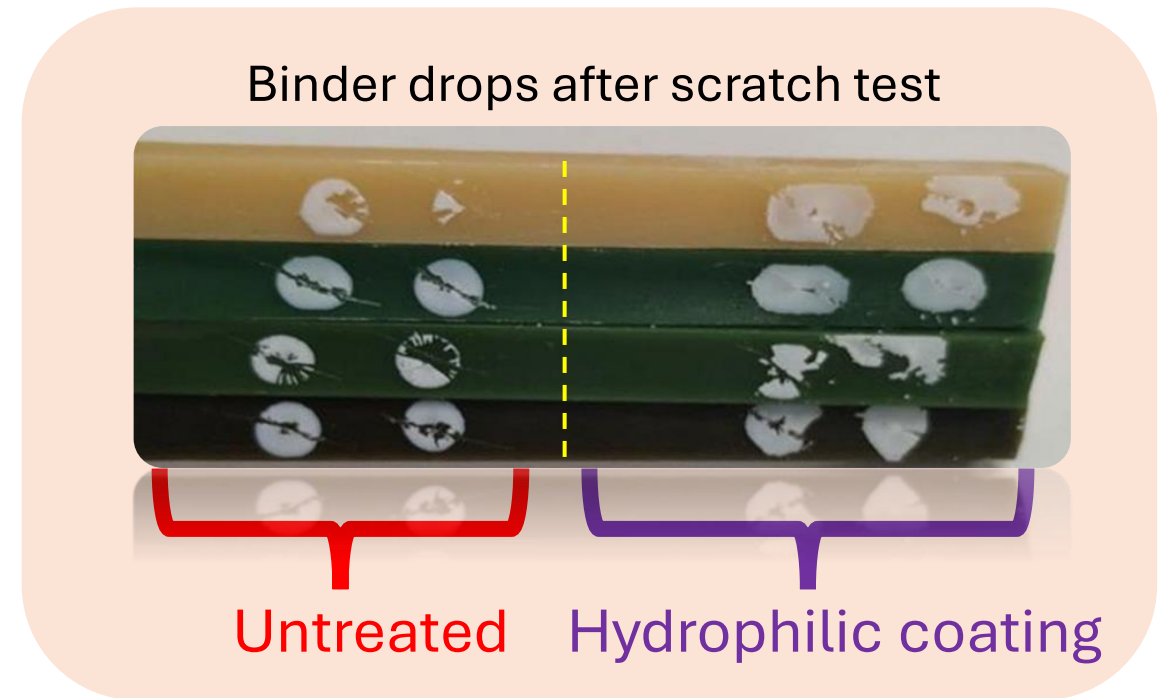
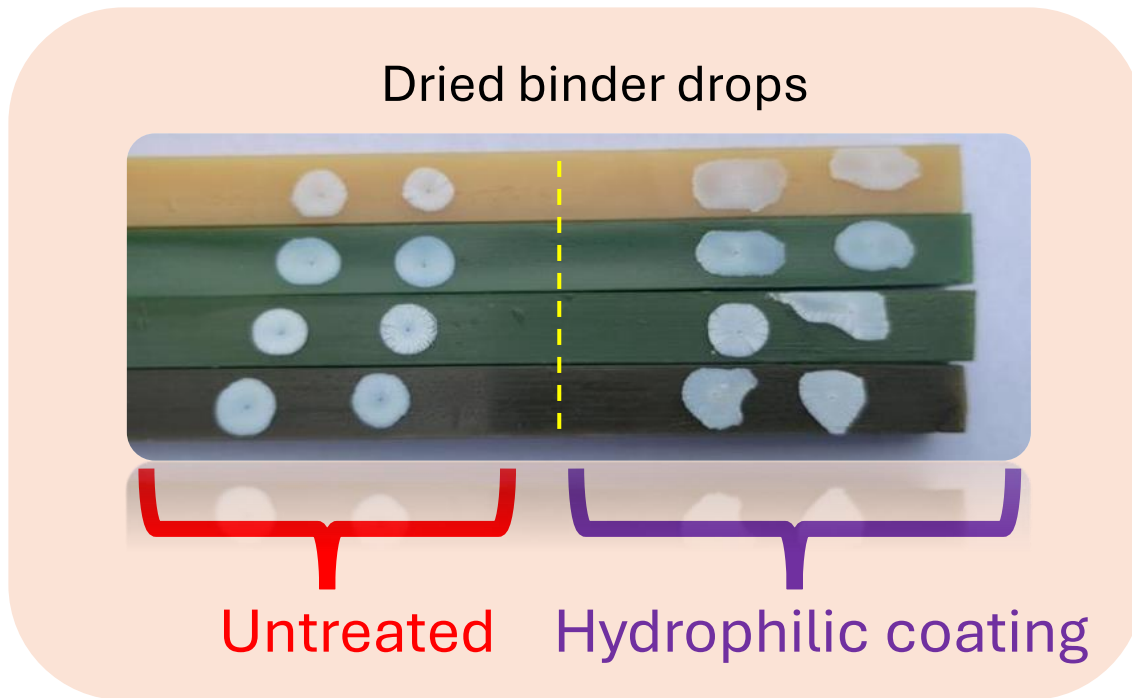
Results:

- Coated bars show better adhesion to shell
- Sharper dripping line



Binder solution testing

- Wax bars coated on the right side were treated with Binder solution*
- The coated side shows lower WCA when 20 μL drops of binder are added.
- Dried binder drops adhere more to the coating resisting the scratching

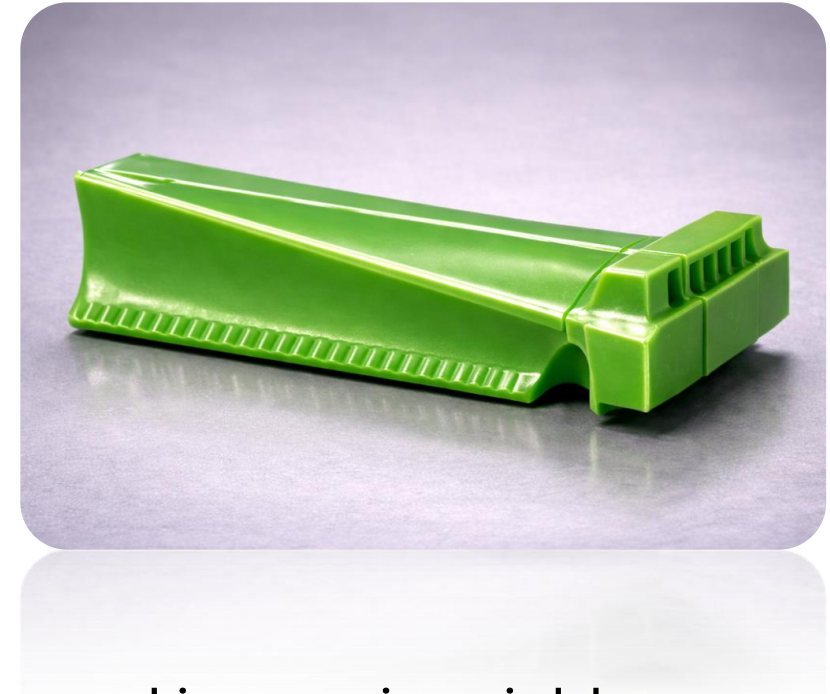


Conclusion

- Successfully developed a surface coating for investment casting
- Improved wettability and increased surface energy
- Improved shell adhesion

Hydrophilic coating : Info and Application

- Can be applied as spray or wiped with a cloth directly onto the wax tree
- Can be used where a wash step is not possible
- Beneficial for intricate, concave, or large parts
- Compatible with washed or unwashed wax trees and with the downstream process of shell coating
- It is fast acting, not harmful and has low ash level
- This solution is designed to improve shell coating adhesion and increasing yields



Future steps

- First generation of this coating is under trial
- The coating will be tested soon in selected investment casting foundries
- Second generation of surface coatings for investment casting already under development
- Stay tuned for future news



Thanks

- Thanks to Blayson technical and quality team
- Thanks to Eco Point laboratories
- You for your attention today