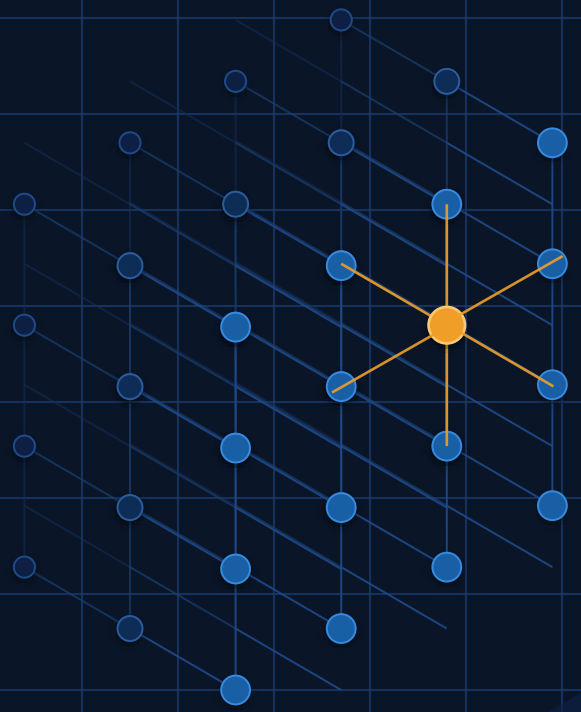
AI / ML FOR CRYSTALLINE MATERIAL MANUFACTURING

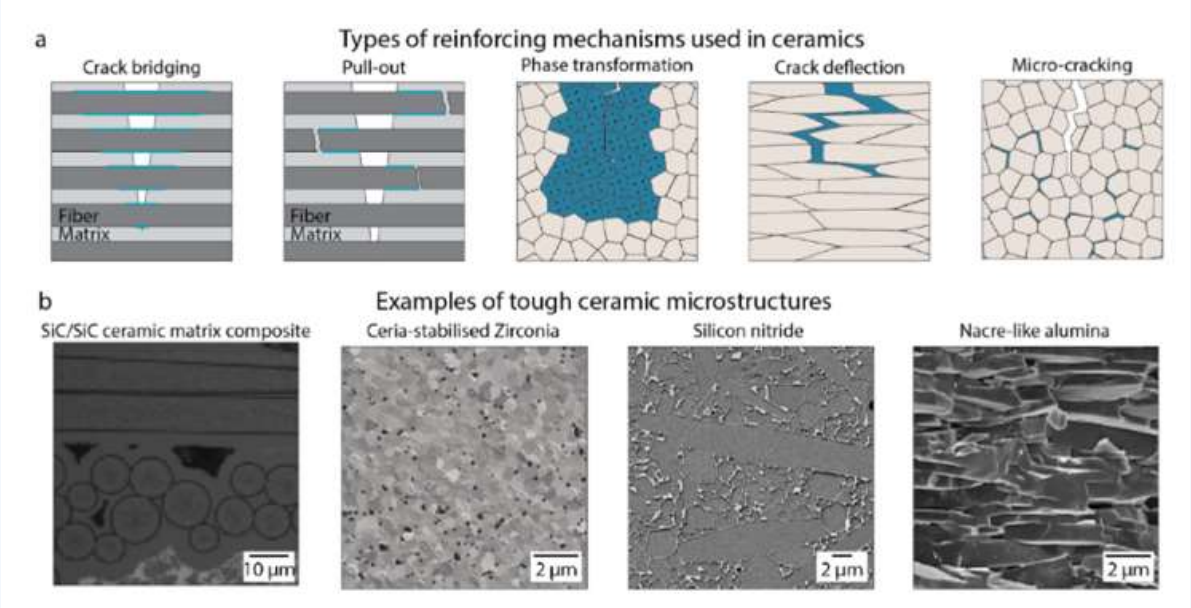
Sustainability & Efficiency in High-Performance Material Processing

Panel · May 5, 2026 · 4:00 PM

Katie Colbaugh, PhD · CEO / Founder Leucite

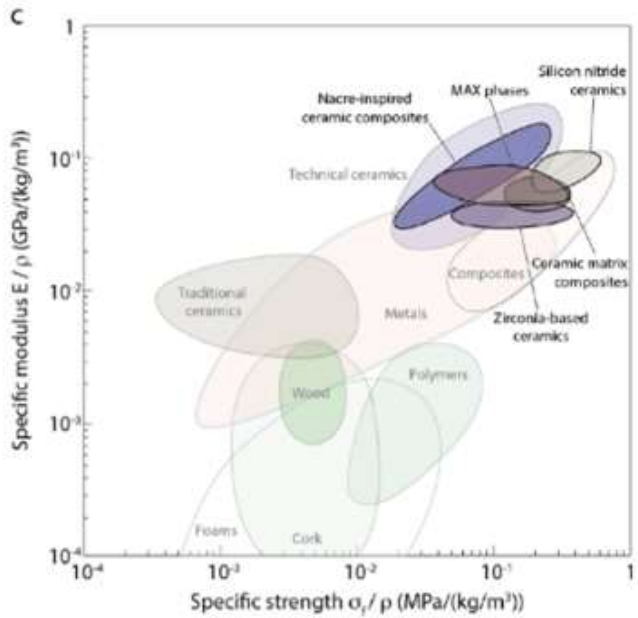


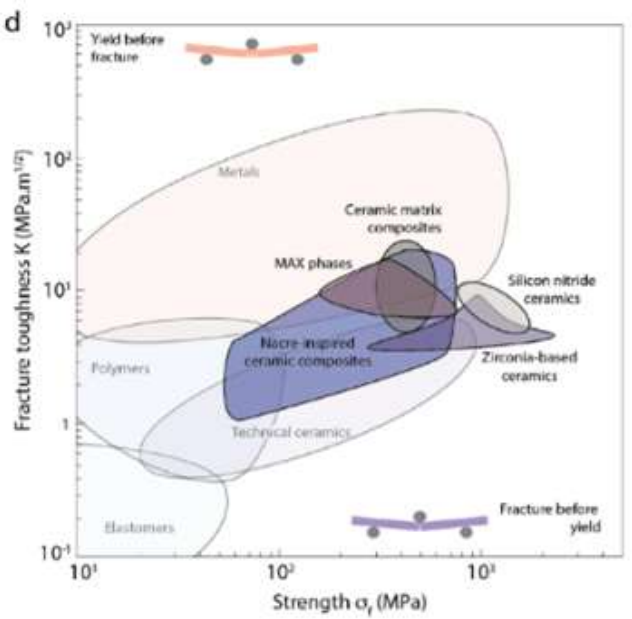
LEUCITE



Ceramics manufacturing,
You have to love the challenge

… And we do!!





Gavalda-Diaz, O. et. al. Toughening of ceramics and ceramic composites through microstructure engineering: A review. 2025 doi/10.1177/09506608241308337

LEUCITE: ML + Material knowledge + Production experience

Built for material manufacturing

Leucite software solution uses **data to guide material manufacturing**, learn from previous runs, predict possible outcomes, and support decision-making during and after each manufacturing cycle.

Materials first ML

ML models specifically built for materials manufacturing

No general AI

Experts in the loop

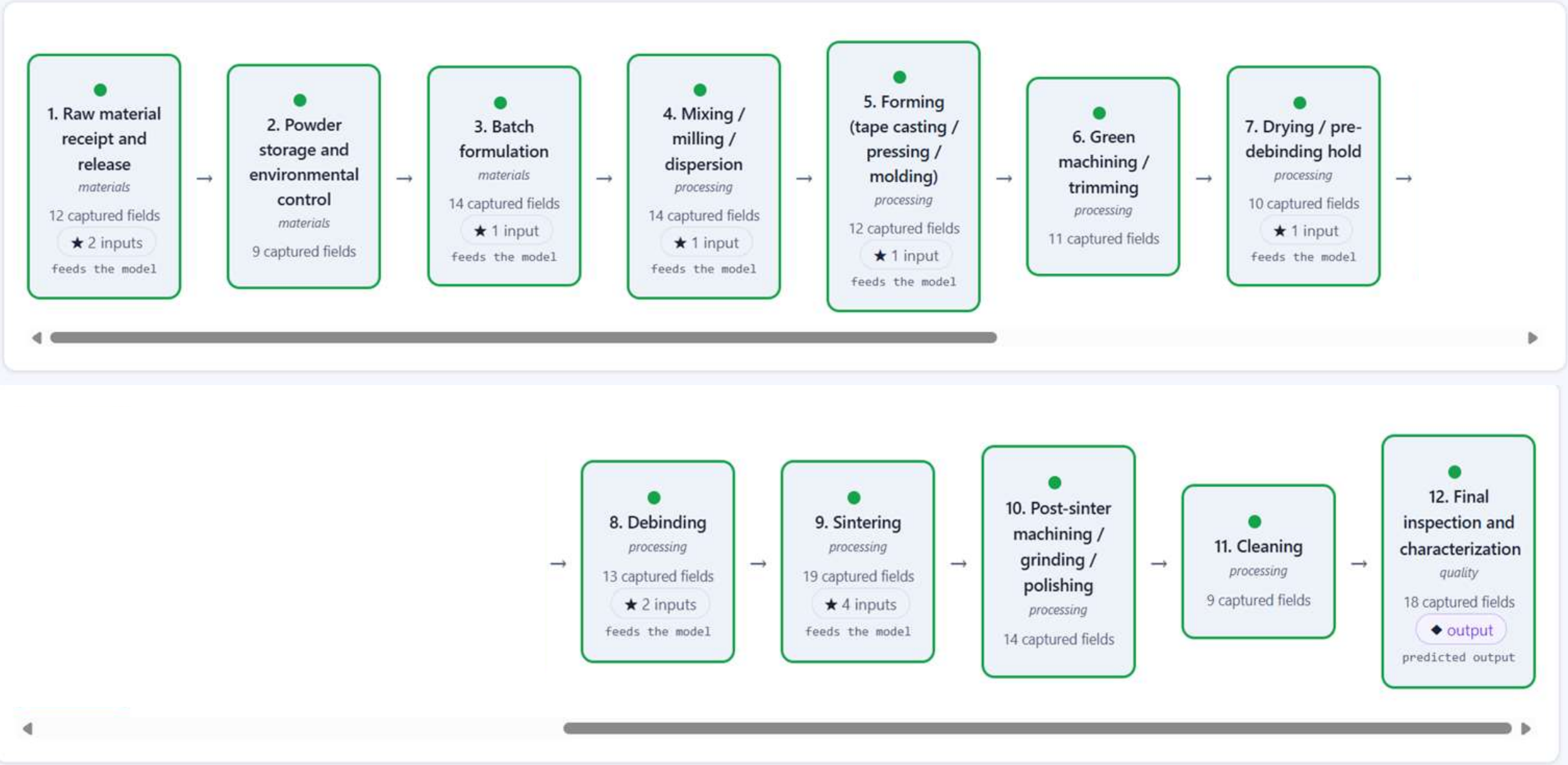
From problem definition, through data acquisition to meaningful insights you work with materials, data, and ML engineers every step of the way

Practical & Efficient

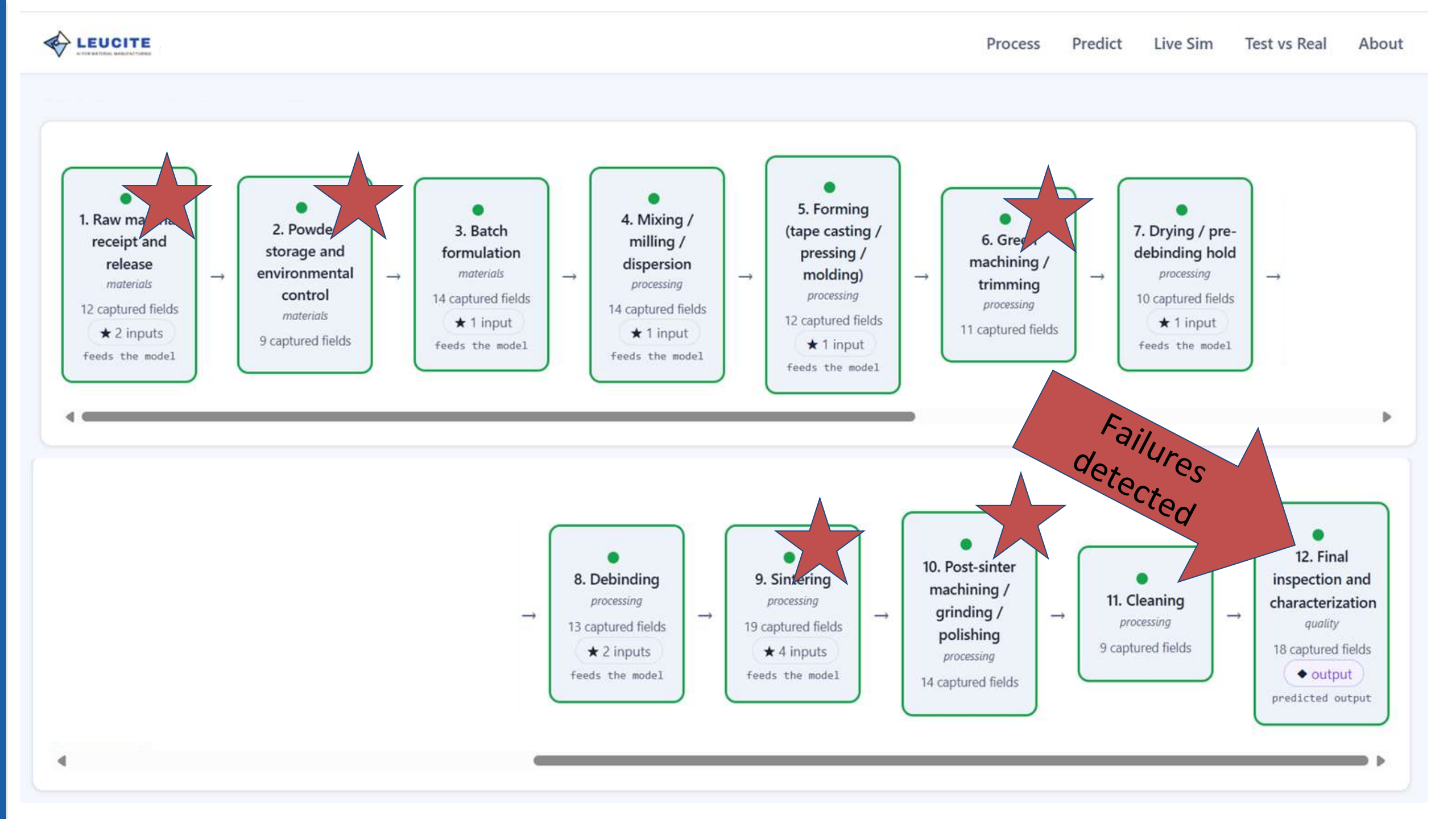
Start with priority challenges

Determine meaningful data scope and work real life manufacturing challenges

Outcomes: **Minimized time for process analysis. Reduced defects, failures and production waste. Accelerated transition from lab to industrial scale manufacturing.**


1. Raw material receipt and release
materials
12 captured fields
★ 2 inputs
feeds the model
2. Powder storage and environmental control
materials
9 captured fields
3. Batch formulation
materials
14 captured fields
★ 1 input
feeds the model
4. Mixing / milling / dispersion
processing
14 captured fields
★ 1 input
feeds the model
5. Forming (tape casting / pressing / molding)
processing
12 captured fields
★ 1 input
feeds the model
6. Green machining / trimming
processing
11 captured fields
7. Drying / pre-debinding hold
processing
10 captured fields
★ 1 input
feeds the model
8. Debinding
processing
13 captured fields
★ 2 inputs
feeds the model
9. Sintering
processing
19 captured fields
★ 4 inputs
feeds the model
10. Post-sinter machining / grinding / polishing
processing
14 captured fields
11. Cleaning
processing
9 captured fields
12. Final inspection and characterization
quality
18 captured fields
◆ output
predicted output


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LEUCITE
Process
Predict
Live Sim
Test vs Real
About
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LEUCITE AIN Ceramic Process Dashboard

Process Predict Live Sim Test vs Real About

Test vs Real Data

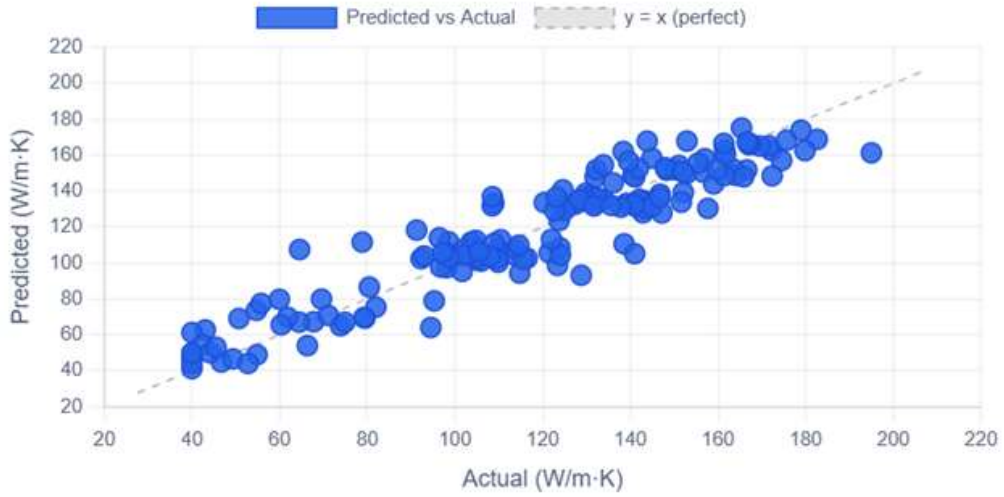
Held-out evaluation of the AIN thermal-conductivity model. The variant picker switches between the synthetic held-out split and the 24 hand-curated seed parts; each shows predicted vs actual, residuals, and held-out metrics.

Thermal Conductivity

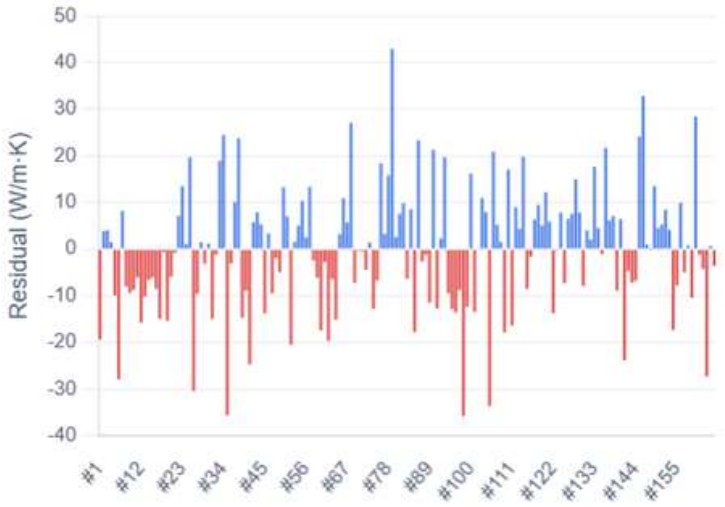
Variant: Held-out synthetic (165 parts)

xgboost · 12 features · trained 659 / test 165

PREDICTED VS ACTUAL



RESIDUALS (PRED – ACTUAL)



METRICS

N	165
R^2	0.879
RMSE	13.3 W/m·K
MAE	10.3 W/m·K

DISCLAIMER: FOR CONFIDENTIALITY REASONS, THIS DEMO IS SHOWING SYNTHESIZED DATA NOT REAL DATA.

LEUCITE AlN Ceramic Process Dashboard

Predict Thermal Conductivity

Enter process inputs from upstream steps and get a predicted thermal conductivity in W/m·K. Use
dropdown to rewind to an earlier point in the line and see how the prediction sharpens as each ste
SHAP drivers below show which inputs pushed the prediction.

Current process stage: 7. Drying / pre-debinding hold — features unlock as

Inputs

▾ 1. RAW MATERIAL RECEIPT AND RELEASE 2 fields

Powder oxygen content: 1.253
μ=1.25 σ=0.238 wt%

Powder D50 particle size: 1.535
μ=1.54 σ=0.508 μm

▾ 3. BATCH FORMULATION 1 field

Y_2O_3 sintering aid: 3.57
μ=3.57 σ=0.909 wt%

▾ 4. MIXING / MILLING / DISPERSION 1 field

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Prediction

Single per-target XGBoost model trained on 24 seed parts plus 800 synthetic bootstrapped rows across 12 process features. Confidence band is one residual σ from the held-out split.

THERMAL CONDUCTIVITY

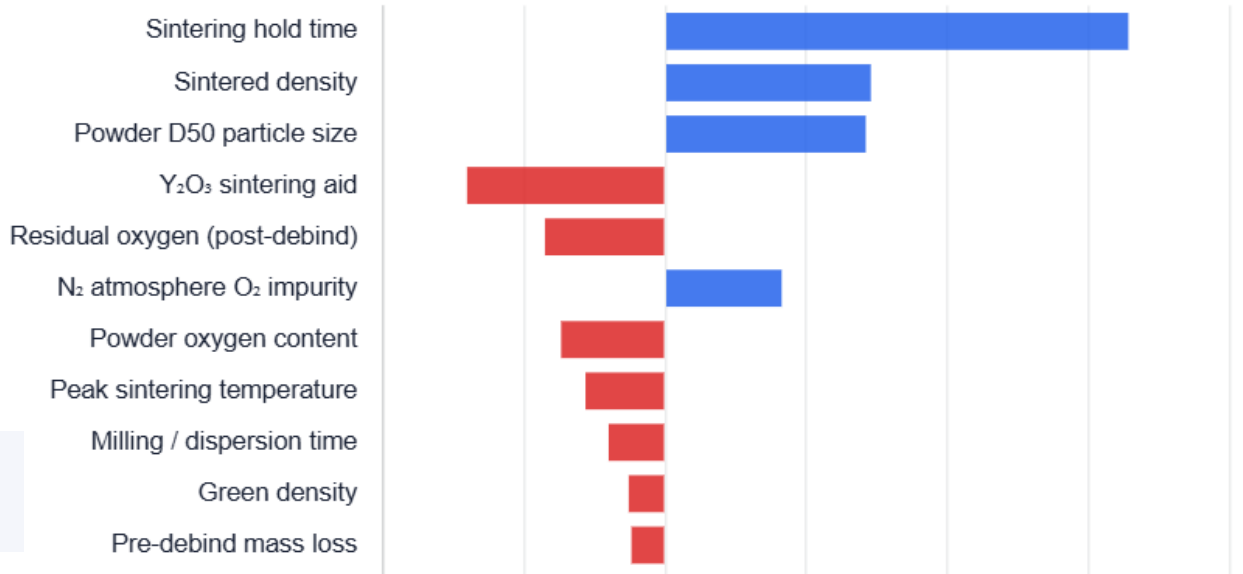
123.2 W/m·K

XGBoost · 12 features

±1σ: 97.83 – 148.6 W/m·K

SHAP Drivers

How each input pushed the prediction away from the dataset baseline of **118.5** W/m·K. Positive (blue) pushes the prediction up; negative (red) pushes it down.



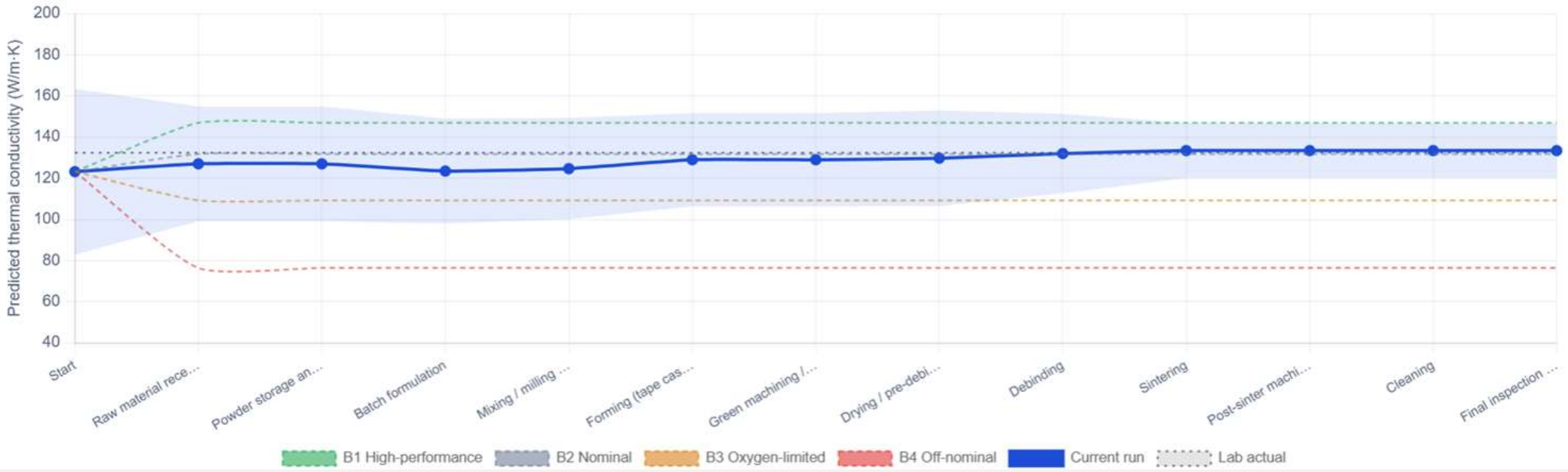
LEUCITE AIN Ceramic Process Dashboard

Process Predict Live Sim Test vs Real About

1 Raw material receipt and... ★
2 Powder storage and...
3 Batch formulation ★
4 Mixing / milling / dispersion ★
5 Forming (tape casting / pressin... ★
6 Green machining / trimming
7 Drying / pre-debinding hold ★
8 Debinding ★
9 Sintering ★
10 Post-sinter machining /...
11 Cleaning
12 Final inspection and...

Prediction trajectory

The bold line is the current run; the shaded band is the Monte-Carlo uncertainty given which stages have arrived.
Faded lines are per-regime baselines (mean inputs). The dashed horizontal line is the part's lab-actual.



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Want to learn more, contact us!

How can I trust the models?

Domain knowledge embedded
Physics law can be validated
And you can test it for real!

Can I just use Copilot or General AI?

No – this will not work!

How can I get started?

Contact us!
We will work with you to define your target result, overcome data challenges and make ML work for you



Thank you!

LEUCITE

