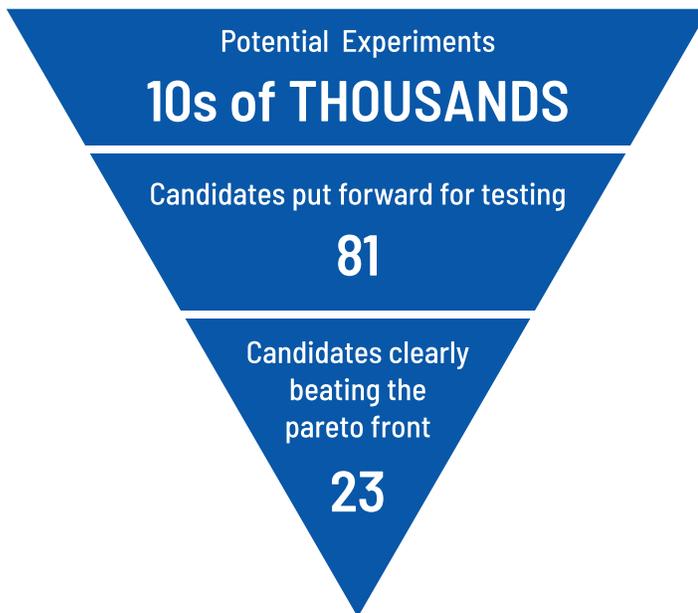


MACHINE LEARNING ACCELERATES RESEARCH

DATA-DRIVEN ASSESSMENTS GUIDE
R&D STRATEGY



EXECUTIVE SUMMARY

ACCELERATED RESEARCH EFFORTS

5 WEEKS TO FIND A
CANDIDATE ABOVE
THE PARETO FRONT
– 8 WEEKS TO
EVALUATE ALL
SUBSTRATE OPTIONS

PERFORMANCE IMPROVED

23 HIGH PERFORMING
CANDIDATES WITH
BETTER OPTICAL
AND MECHANICAL
PROPERTIES FOUND

NEW INSIGHTS

IDENTIFIED
SUBSTRATE WITH
HIGH POTENTIAL FOR
OUTPERFORMING
EXISTING PRODUCT
LINE

REUSABLE AI MODEL

MODEL RE-USED
TO EVALUATE
PROCESSING
PARAMETERS WITH
50% REDUCTION IN
SETUP TIME

THE CHALLENGE

For our customer, a glass manufacturer, optical and mechanical property profiles determine the target applications, but optimizing both at the same time is difficult. Newly developed materials must also be easily manufacturable, in large volumes, at low costs. For a target application, the glass manufacturer wanted to optimize one particular mechanical property and one optical one while imposing a processing constraint. To achieve these performance criteria, the customer could change the selection of the substrate material and/or the processing parameters.

AI-enabled Digital Strategy: This customer is undertaking a global initiative to digitalize the business to reduce costs and increase innovation. This customer is evaluating the ability of Citrine's platform to enable their R&D team to be data-driven in their experimental design.

Glass optimization project: The customer identified tens of thousands of different possible candidate materials, but there were only two measured samples that fit their manufacturability criteria. It was therefore necessary to use data from candidates that didn't meet all the criteria and extrapolate to find new candidates – via a process called transfer learning.

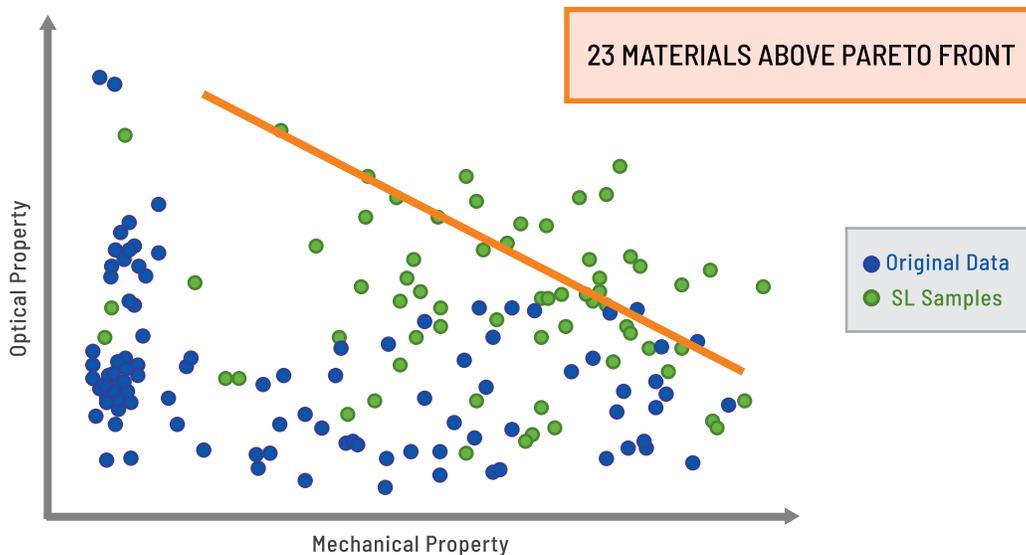
THE APPROACH

Citrine partnered with the customer's research scientists to iteratively train and improve a Machine Learning model – a process called sequential learning. An initial model was trained on existing data from successful and "failed" experiments to predict the properties of new materials close to the two materials that met all the acceptance criteria. The team then synthesized a small set of new samples based on these predictions. The scientists added this new data to the model, then retrained the model until they met the desired performance criteria. In addition to predicting properties of the new materials, the Citrine Platform also generates uncertainty calculations for these predictions, which helped the scientists identify opportunities to improve the model and promising new candidates.



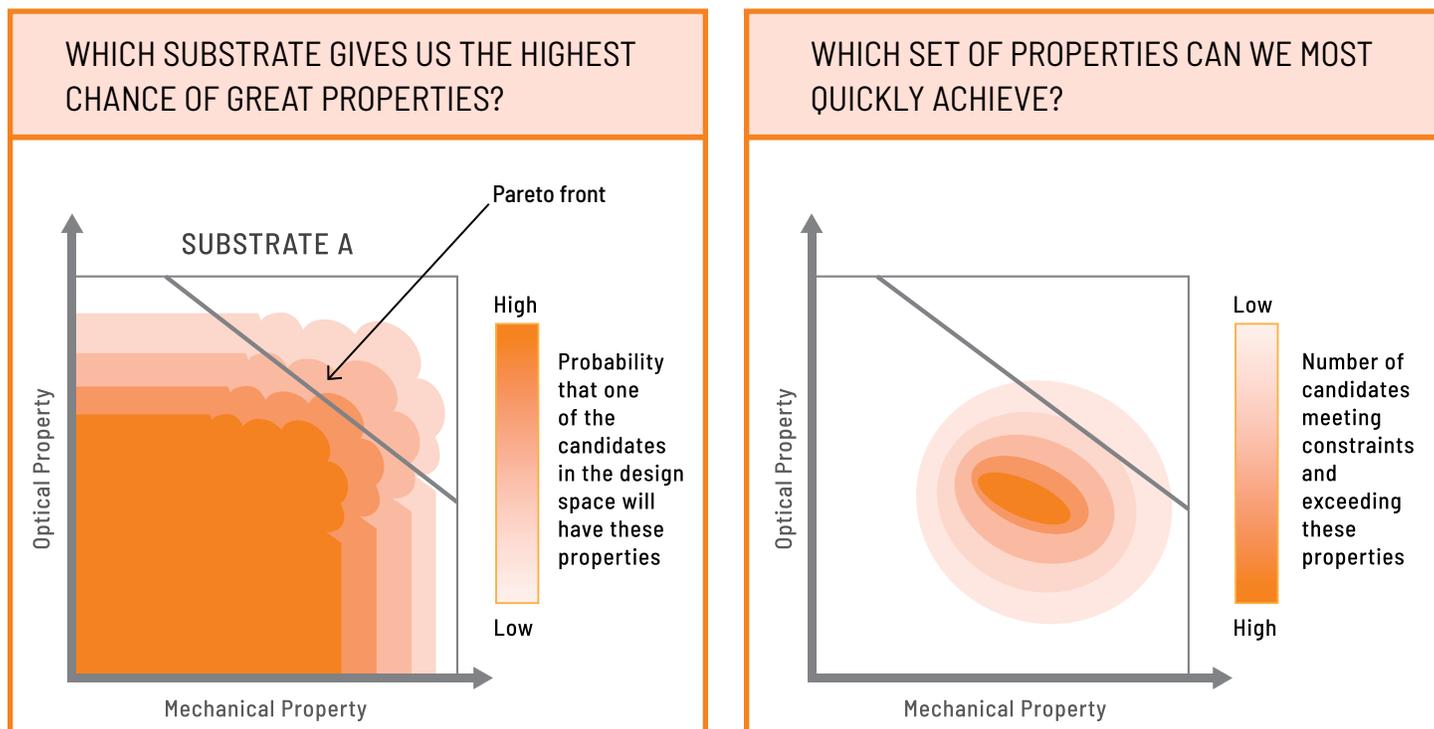
THE RESULTS

In just 18 weeks, Citrine and our customer found 23 materials that met the performance criteria and had better optical and mechanical properties than anything in the company's portfolio. This required only 81 samples to be prepared and tested.



STRATEGIC DIRECTION

The customer had an important choice to make regarding R&D project direction. Selecting the right substrate was critical to meet performance targets. Using the Citrine Platform, the customer identified which substrate a) had a candidate with the highest probability of the best performance, and b) which substrate had lots of high performing candidates, so that finding those candidates was likely to be quicker. This information allowed the R&D team to make data-driven decisions on the investment of time and resources, reducing risk and increasing the likelihood of success.



CLEAR VISUALS FOCUS THE RESEARCH PORTFOLIO ON THE BEST CHANCE OF SUCCESS

FIND OUT MORE

ABOUT CITRINE INFORMATICS

Citrine Informatics is the award-winning materials informatics platform for data-driven materials and chemicals development. It won the 2017 World Materials Forum Start-up Challenge and 2018 AI Breakthrough award as the "Best AI-based Solution for Manufacturing." The Citrine Platform combines smart materials data infrastructure and Artificial Intelligence, which accelerates development of cutting-edge materials, facilitates product portfolio optimization, and codifies research IP; enabling its reuse and preventing its loss. Citrine's customers include Panasonic, BASF, LANXESS, and some of the biggest and most respected names in the materials and chemicals industry in Asia, North America, and Europe. For more information visit our website at [Citrine.io](https://citrine.io), or contact us at +1 650-276-7318.