

CITRINE ACCELERATES DEVELOPMENT TIME FOR ADDITIVE MANUFACTURING

3D PRINTABLE AEROSPACE-GRADE ALLOY
DEVELOPMENT REDUCED FROM YEARS TO DAYS



Aluminum 7A77.60L powder from HRL. Copyright 2019 HRL Laboratories, LLC.

EXECUTIVE SUMMARY

FAST TIME TO MARKET

TWO YEARS
AFTER RESEARCH
PUBLICATION -
COMMERCIALIZED
WITH NASA AS THE
FIRST CUSTOMER

TIME SAVED

EXPERIMENTAL LAB
WORK REDUCED
FROM YEARS TO DAYS
DUE TO MACHINE
LEARNING APPROACH

PERFORMANCE IMPROVED

NEW ALLOY POWDER
RETAINS STRENGTH
WHEN USED IN
OFF-THE-SHELF 3D
PRINTING EQUIPMENT

FIRST TO MARKET

FIRST ADDITIVE
ALLOY REGISTERED
BY THE ALUMINUM
ASSOCIATION

*“Once we told them what to look for, their big data analysis narrowed the field of available materials from hundreds of thousands to a select few.
We went from a haystack to a handful of possible needles.”*

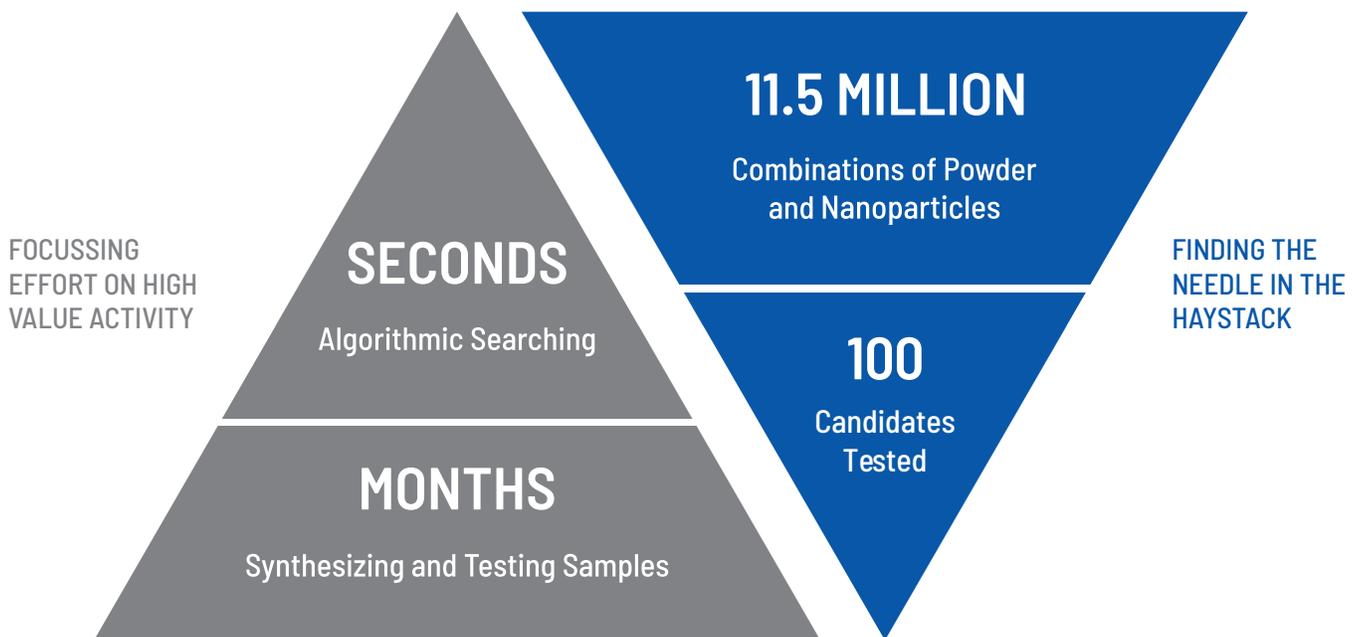
Brennan Yahata,
HRL

THE CHALLENGE

Additive Manufacturing (AM) enables the production of near-net-shape parts, reducing materials wastage and the need for welding and other post-processing. The Aerospace and Automotive industries need alloys that are lightweight, and have high strength at extreme temperatures. To date, 3D-printed aluminum alloys have been inadequate for widespread use. HRL Laboratories, jointly owned by Boeing and General Motors, utilized the Citrine Platform to help find a 3D-printable aluminum alloy strong enough for aerospace applications.

THE APPROACH

HRL wanted to find nanoparticles that nucleate a microstructure less prone to hot cracking, a phenomenon where cracks form during the solidification of 3D-printed metal. The Citrine Platform combined classical nucleation theory, rules on lattice spacing, thermodynamic stability, and density, and machine learning, to rapidly search through 11.5 Million combinations of powders and nanoparticles.



THE RESULTS

The Citrine Platform identified 100 candidate combinations of powder and nanoparticles that optimized the desired properties for the HRL team to test. The resulting material AL 7A77 is the first high strength Aluminum Alloy powder feedstock for off-the-shelf AM machines that is registered with the [Aluminum Association](#). [The first commercial customer for this new product is NASA Marshall Space Flight Centre](#).

The technique used here can also be used to make unweldable metals weldable, another wide-ranging application and commercial avenue.

HRL has first mover advantage and has cemented its reputation as a pioneer on the cutting edge. See their video:

<https://youtu.be/8YwlenA4bdg>

 [The researchers have published a paper in Nature which describes their breakthrough in detail.](#)

WHAT NEXT?

Materials Informatics is transforming the process by which new materials and chemicals are developed. Part of the larger digital transformation in manufacturing, the application of data-driven methods to materials R&D has huge potential benefits. Through an AI-enabled materials data infrastructure, the Citrine Platform helps customers accelerate their rate of innovation, whether they develop new materials faster to meet customer and market needs, or reduce raw materials & processing costs through data-driven assessments. Contact us to find out how our platform can accelerate development across your R&D organization.

FIND OUT MORE



DOWNLOAD PAPER
IN NATURE

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, or contact us at +1 650-276-7318.