Louisiana materials scientists feeding a U.S. advanced manufacturing revolution

EPS - 1541079
RII: Consortium for Innovation in Manufacturing and Materials (CIMM) Louisiana 2015-2020
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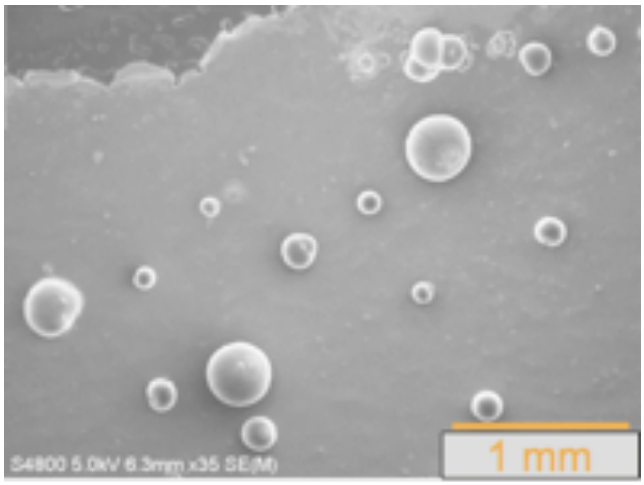
Outcome: A team of researchers led by Dr. Chester Wilson at Louisiana Tech University is developing a new method to make tiny metal beads, called “feedstock,” used to make complex metal 3D parts and prototypes.

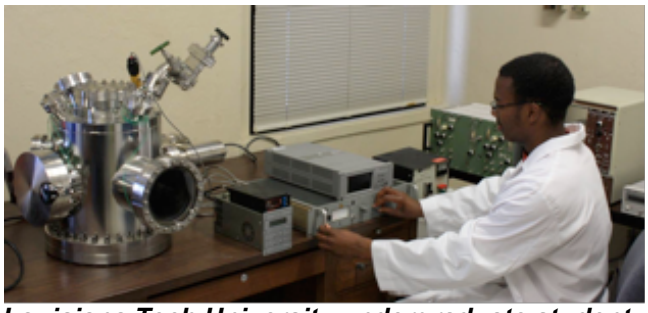
The next advanced manufacturing wave in the U.S. will feature metal parts manufactured using Selective Laser Melting (SLM) machining. The SLM process works like a 3D printer by spreading a layer of feedstock metal beads on a table, then pulsing a laser beam at points along the layer. As layers are added, the 3D metal part takes shape.

Feedstock metal beads are extremely tiny at about 200 microns in diameter, which is similar to the diameter of a human hair. The current process to make the beads involves spraying a mist of molten metal into a vacuum — a very expensive process.

The Louisiana research team is developing a new bead fabrication process, which produces higher quality alloy beads at a dramatically lower cost. They are using a chemical process called chemical deposition synthesis which is similar to electroplating.



Microspheres made by chemical deposition synthesis viewed with a scanning electron microscope. Credit: Dr. Chester Wilson, Louisiana Tech University, chester@latech.edu.



Louisiana Tech University undergraduate student Darrian Mills uses laser spectroscopy to test samples. Credit: Dr. Chester Wilson, Louisiana Tech University, chester@latech.edu.

Impacts/Benefits: SLM machining is the most widely used manufacturing system in place for making complex 3D parts. However, there are two main hurdles in using this process to mass produce parts: Cost and alloy strength. This new process allows the production of stronger alloyed beads at a lower cost.

Background: Parts made from stainless steel that the military uses, for instance, require forging factories that no longer exist. 3D laser manufacturing could replace this manufacturing technique, but the current cost per part is too high. Chemical deposition synthesis would dramatically reduce the cost of the feedstock material and revolutionize the advanced manufacturing industry in the U.S.