

Ames Laboratory-developed titanium powder processing gains international customer base

December 8 2015



A titanium bolt and the corresponding amount of titanium powder necessary to create it.

Titanium powder created with Ames Laboratory-developed gas-atomization technology has hit the market. Praxair Inc. now offers fine, spherical titanium powder for additive manufacturing and metal injection molding of aerospace, medical and industrial parts. It marks the first time large-scale amounts of titanium powder are available to industry with a potential for low-cost, high-volume manufacturing.

"Titanium powder made with this technology has huge potential to save manufacturers materials and money," said Ames Laboratory scientist Iver Anderson. "Creating titanium powder of high quality at great volumes was what we materials scientists called the Holy Grail of gas

atomization."

What exactly makes titanium powder the Holy Grail? Titanium's strength, light weight, biocompatibility and resistance to corrosion make it ideal for use in parts ranging from aircraft wing structures to replacement knee joints and medical instruments. Using ultra-fine, high-purity spherical titanium powder to 3-D print or mold these parts generates 10 times less metal waste than traditional casting of parts. However, ultra-fine titanium powder was nearly impossible to produce from the molten state because liquid titanium is readily contaminated by dissolved gases and can't be contained by normal ceramic melting crucibles, which it can rapidly erode, to the point of spilling through.

"Our invention of an in-stream melt heating guide tube was critical to boost the melt temperature by at least 100°C, allowing adaptation of water-cooled 'clean' melting technologies, normally used to melt and cast strong, reliable aerospace Ti parts," said Anderson. "This new 'hot nozzle' made possible precise feeding of highly energetic close-coupled atomizers for efficient production of fine Ti powders."

Two members of Anderson's research team, Joel Rieken and Andy Heidloff, created a spinoff company, Iowa Powder Atomization Technologies, and exclusively licensed Ames Laboratory's titanium atomization patents. IPAT worked to further optimize the titanium atomization process and along the way won several business and technology awards for their efforts, including the Department of Energy's Next Energy Innovator competition in 2012.

In 2014, IPAT was acquired by Praxair, a Fortune 250 company and one of the world's largest producers of gases and surface coatings. And earlier this year, Praxair [announced](#) they had begun to market titanium powder.

"We talk regularly about the Department of Energy's goal of transferring research from the scientist's bench to the marketplace. This work is a strong example of how that goal can become reality. The ingenuity and continued hard work and commitment by our scientists and our licensee to get the technology to market cannot be underestimated. They make my job of transferring technology developed at Ames Laboratory into the marketplace so much easier," said Ames Laboratory Associate Director Debra Covey.

Provided by Ames Laboratory

Citation: Ames Laboratory-developed titanium powder processing gains international customer base (2015, December 8) retrieved 13 March 2024 from <https://phys.org/news/2015-12-ames-laboratory-developed-titanium-powder-gains.html>

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