

Alfred University alumni, faculty and staff, students contribute to cover article for ACerS bulletin
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ALFRED, NY – A group of Alfred University alumni, faculty and staff, and students contributed to the cover article in the most recent issue of the American Ceramic Society Bulletin, which examines how ceramic components produced by three-dimensional printing can aid in research into possible human habitation of the moon and Mars.

“To Infinity and Beyond: Outer Space Applications of 3-D Ceramics Printed Via Ink Jet Methods” is the title of the cover story in the [August 2018 ACerS Bulletin](#).

The article outlines the need for small, functional ceramic components – radiation detectors, humidity sensors, chemical sniffers – to aid in establishing exploratory bases on the moon or Mars. Shipping the components to outer space destinations is extremely expensive and limits their on-site inventory, the article notes. Manufacturing the ceramic components with three-dimensional printing, using binding agents (adhesive materials) and simulated lunar and Martian soils would significantly decrease the cost of shipping the components from Earth to outer space.

Authors of the article include Jim Royston, a 1989 Alfred University graduate (B.S., electrical engineering) and president/chief operating officer of L2 Aerospace in Melbourne, FL; Xingwu Wang, professor of electrical engineering and renewable energy engineering at Alfred University; David Crenshaw, director of Alfred University’s digital fabrication center; Gerry Wynick, retired scanning electron microscopist in Alfred University’s Inamori School of Engineering; Patrick Cigno, who earned a master’s degree in ceramic engineering from Alfred University in May; and Phillip Kurtis, who will be a senior at Alfred this fall, majoring in mechanical engineering. Cigno’s work on the article was part of his graduate thesis; Kurtis worked on the project as an undergraduate student researcher.

L2 Aerospace, founded in 2010 by retired U.S. Air Force General Lance Lord, provides integrated ground, air and space-based products and services. Sam Deriso, chief engineer for L2 Aerospace, also contributed to the ACerS Bulletin article.

Other authors of the paper are Carol Craig and Ryan Jeffrey of Craig Technologies, Cape Canaveral, FL. Carol Craig is founder and CEO of Craig Technologies, which engineers, designs, prototypes, manufactures and tests a wide variety of mission-critical systems for a diverse range of customers and operates a nationally-recognized Aerospace & Defense Manufacturing Center (ADMC) in Cape Canaveral. In 2017, Craig Technologies was awarded a contract with NASA to support research and engineering products and services needs of the International Space Station. Jeffrey is a mechanical engineer at Craig Technologies.

Wang explained that research on printed functional ceramic components, and subsequent testing, would be conducted on the International Space Station (ISS). The tests would study how 3-D-printed components would hold up against the harsh radiation environment found on the moon and on Mars. The mission to deliver those 3-D-printed samples to the ISS is expected to take place late this year or early 2019.

Cost of shipping components such as radiation detectors and humidity sensors to the ISS would be prohibitive; current cargo shipments to the space station are estimated at between \$20,000 and \$60,000 per kilogram, according to the ACerS Bulletin Article.

“Thus, if raw materials for missions to the moon or Mars can be obtained on-site, shipping costs could be substantially reduced,” the article points out. “Further, beyond small devices such as radiation detectors, humidity sensors and chemical sniffers, large amounts of raw materials will be needed for human habitats based on ceramics.”