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Technology

ONR Researcher Tests Marine Aluminum Alloys

By Cynthia Greenwood

Using his expertise in electrochemistry, researcher Derald Chriss will perform corrosion tests on marine aluminum alloys while developing a new nano-channel fabrication technology for the Naval Surface Warfare Center Carderock Division (NSWCCD) in West Bethesda, MD.

Chriss, an assistant professor of chemistry at Southern University in Baton Rouge, LA, was selected to participate in a 10-week research program sponsored by the Office of Naval Research (ONR), which routinely places university researchers at naval installations to forge partnerships. Chriss, an expert in physical and analytical chemistry, teaches general chemistry and such courses as "Instrumental Analysis" and "Microcomputers and Chemistry."

During his appointment, which runs from May 22 to July 28, Chriss will conduct a variety of tests on aluminum to determine the best corrosion-resistant alloys for use in various naval applications. For one series, he will examine aluminum's susceptibility to intergranular corrosion through mass loss and the material's susceptibility to exfoliation corrosion. "These tests involve exposing samples to nitric acid to see if they exhibit susceptibility to intergranular corrosion, and also subjecting other samples to an ammonium ion-based solution to determine susceptibility to exfoliation corrosion, both under controlled temperature conditions for a 24-hour period." Chriss will also expose aluminum samples to a ferric chloride solution at various temperatures for a 72-hour period, to test their resistance to crevice corrosion.

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In a different study, Chriss will attempt to coat small-scale glass samples for the purpose of detecting corrosion. "Our work with nano-channel fabrication is in the infant stages," he said. "We have to develop the technology to operate at a scale that is considerably smaller than traditional research at the micro-scale. At the microscale, we work with dimensions of roughly 10^{-6} meters, whereas at the nanoscale level, we are grappling with dimensions of roughly 10^{-9} meters, an order of magnitude 1,000 times smaller than microscale."

"The ultimate goal of this research component is to develop nanotubes for use as sensors to assist in early corrosion detection," he explains. During his stint at NSWCCD, Chriss hopes to gather enough information to develop a grant proposal to pursue related work within an ongoing collaboration between NSWCCD and instructors at Southern University.