Abstract

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Copper Alloys and SARS-CoV-2

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Abstract

The antimicrobial properties of copper and its alloys are well known. For centuries, copper has been protecting ships from barnacles and biofouling while also being utilized in bandages and various medical devices to fight infection. Advances in materials and processes have produced copper alloys that are highly functionalized, with increased durability, tarnish resistance, toughness and characteristically high antimicrobial capacity. The US EPA has certified certain copper alloys as antimicrobial, allowing for public health claims and kill times against certain pathogens that are well known to contribute to HAI. And yet, as of the beginning of 2020, these advanced alloys had yet to find their way into widespread patient care. Given the potential of antimicrobial copper alloys in healthcare, a large research project was undertaken from 2007-2012. In this project copper alloys underwent prodigious testing in hopes of achieving US EPA certification to neutralize microorganisms that contribute to healthcare acquired infections. This testing, which was facilitated through multiple studies and performed by intra-institutional research teams, included laboratory research testing as well as statistically significant clinical trials. The goal of the project was to close the gap between research findings and real-world application, thereby facilitating the translation of antimicrobial copper technology "from the lab bench to the bedside." The antimicrobial capacity of the copper alloys tested in these protocols provided the required data for certified copper alloys to make public health claims against the 6 specific bacteria tested under the EPA-approved test protocols. Given these results, it is difficult to understand why copper and copper alloys have not received widespread adoption into healthcare settings. Some of this delay may be due to industry dogma, but a greater share of the blame is more likely contributable to the switching cost associated with copper surface adoption. The components used in the clinical trial above were largely custom parts with copper surfaces built in from the manufacturer. Though the difference in cost between the standard and copper components is relatively small, implementing such components in ICU rooms means existing components must be replaced with new a copper-equipped component which is often a large capital expenditure.

Biography

Dr. Hunt joined the College of Engineering in 2005. She received B.S., M.S., and Ph.D. degrees in mechanical engineering from Texas Tech University in 2001, 2002 and 2005, respectively. She is the author of Nanostructured Metallic Alloys: Synthesis, Properties, and Applications and the popular children's book Engineering Elephants along with eight additional books. She has coauthored over 50 publications and has made numerous presentations as an invited speaker, both nationally and internationally. Dr. Hunt's research interests include energetic/explosive material reactions and synthesis, high-speed infrared imaging, and engineering education and assessment. She currently holds two patents and three provisional patents for work in developing novel nanostructured materials.