

Light activated bactericidal activity of crystal violet and gold nanocluster treated silicone

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Abstract

The evolution of bacteria resistant to antibiotic is a major threat to the practice of modern medicine. Recent studies have shown that bacteria-contaminated surfaces make a significant contribution to spread of healthcare associated infections (HAI), and that repeated cleaning/disinfection of the contaminated surfaces is not always enough to eliminate pathogens. Light activated bactericidal agents have obtained significant attention as promising candidate to kill bacteria, and they have been widely studied. However, to achieve strong bactericidal activity, they use an intense white light source or require UV-activation. Here our study introduces light activated bactericidal polymer containing crystal violet and gold nanocluster activated at a low flux levels of white light. Thiolated gold nanoclusters were synthesized through a microfluidic flow system and the nanocluster and crystal violet were encapsulated into silicone by solvent swell encapsulation to produce bactericidal polymers. A bactericidal test against *Staphylococcus aureus* showed that the polymer encapsulated with crystal violet did not have bactericidal activity under white light illumination (312 lux). However, additional encapsulation of gold nanocluster into the polymer with crystal violet showed a potent bactericidal activity (>4 log reduction in the number of viable bacteria) after 6 h exposure to white light. It is anticipated that this technology easily applied for devices and healthcare facilities requiring disinfection.

Keywords: *bacteria, healthcare associated infection, crystal violet, gold nanocluster, pathogen*

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Biography

Gi byoung Hwang obtained bachelor's and master's degrees of Mechanical Engineering from Konkuk University, South Korea. He took a research position in Korea Institute of Science and Technology (KIST) in 2010 to 2014. He got PhD in Chemistry Department of University College London (UCL) under supervision of Prof. Ivan P Parkin in 2018. Since 2018, he has undertaken a post-doctoral position in UCL Chemistry Department. He has been awarded 2019-2021 Ramsay Memorial fellowship.