Christopher J Barrett et al., J Biotechnol Biomater 2016, 6:1(Suppl)
http://dx.doi.org/10.4172/2155-952X.C1.050

OMICS International
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Annual Conference and Expo on
Biomaterials

March 14-16, 2016 London, UK

Azobenzene-modified silk bio-gels for light-induced surface patterning

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Silk fibroin from *Bombyx mori* silkworms is used in diverse applications in materials science due to its high availability, low cost, and rich polymer chemistry. Although silk can be processed into various material classes that are suitable for biological material applications, such as tissue engineering, further enhancement of its properties can be achieved through facile chemical modifications of the amino acid side chains. One method to retain the biocompatibility of silk, while enhancing its optical properties is functionalization with azobenzene, yielding a material called AzoSilk.

Upon examining hydrated AzoSilk films under a two-photon microscope, we discovered the appearance of persistent fluorescent patterns within the irradiated areas of the films. The written patterns can be easily visualized by observing the fluorescence emitted at 550 nm, excited by 800 nm. In this microlithographic process, out-of-plane expansion of the film causes micrometre-sized blisters to form near the surface. Micro-blisters were characterized using underwater AFM, and exhibited a 10-fold decrease in modulus. The induced radius of curvature associated with blister formation, together with significant photo-softening are expected to be valuable material characteristics for guided cell growth.

Biography

Christopher Barrett completed his PhD in Chemistry from Queen's University, Canada, and postdoctoral studies in Bio-Engineering at the Massachusetts Institute of Technology. He has published 85 papers in Bio-Materials and Polymer Chemistry in international journals, which have been cited now more than 6000 times, h-index 40.

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