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Ballistic performance of nacre-like aluminium composite plates

By

Dr Luming Shen

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Date: Tuesday, 9 July 2019
Time: 3:00 pm to 4.00 pm
Venue: EA #06-03
Block EA, 9 Engineering Drive 1,
Singapore 117575
Faculty of Engineering,
National University of Singapore



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Abstract

Motivated by the hierarchical structure of nacre, a multi-layered aluminium alloy (AA) 7075-T651 based composite is being developed for ballistic impact applications. The designed nacre-like composite plates with size 100 mm by 100 mm consist of up to 9 layers. Each individual layer is made of 20 mm by 20 mm AA tablets of 1 mm thick bonded together with a toughened epoxy adhesive. To investigate the impact performance, ballistic experiments were performed on the designed composite plates. Experimental results for the bioinspired composite plates with different thicknesses impacted by a steel projectile at various impact velocities were compared with those of the corresponding bulk plates with similar areal density. The results show the nacre-like composite plates perform considerably better than the corresponding bulk plates, particularly for the 5- and 7-layer plates. The enhancement is attributed to the larger area of plastic deformation and tablet delamination in composite plates. The proposed hierarchical structure is found to improve the ballistic performance by varying the failure mode from brittle and localized failure in the bulk plate to more globalized failure in the nacre-like composites.

A brief introduction to other current research projects including dry and partially saturated porous media under impact, and characterization of 3D-printed rock-like material using digital image correlation will also be given in this presentation.

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Speaker Biography



Dr. Luming Shen is currently an Associate Professor in the School of Civil Engineering at The University of Sydney, Australia. He received his Bachelor's degree in Building Engineering and Master's degree in Structural Engineering both from Tongji University. After receiving his PhD in Civil Engineering from the University of Missouri-Columbia, USA in July 2004, he worked as Post-Doctoral Fellow at the same university until January 2006. He was a Lecturer in the Department of Civil Engineering at Monash University, Australia, between January 2006 and July 2008. He then joined the University of Sydney as Senior Lecturer in July 2008. His research interests are mainly focused on mechanics of materials with special interests in impact engineering, multiscale modelling, solid-fluid interaction and porous media. He has published more than 100 peer-reviewed journal articles.

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*****Seats are limited. Please register early. All are welcome and admission is free*****

Location



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