THE UNIVERSITY OF BRITISH COLUMBIA

Department of Civil Engineering

SIERA: Sustainable Infrastructure Research Group

SIERA Group 2020 Seminar Series – Seminar No. 29

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Performance of Lightweight Cementitious Composite Incorporating Carbon Nanofibers

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Dr. Wang Su completed his Ph.D. and M.Sc. degree (first class) at Nanyang Technological University (2014~2020) under the supervise of Prof Tan Kang Hai. Dr. Wang's research activities are focused on nano-engineered ultrahigh performance concrete (UHPC) and derivate lightweight cementitious material with applications to building structures, infrastructures (bridges, roads and tunnels) and offshore/land grouting. He was awarded a full scholarship for Ph.D. candidate by Nanyang Technological University and twice National Scholarship (2011 & 2012) by the Ministry of Education of People's Republic of China. He had 5 publications in SCI journals and conference proceedings during the Ph.D. study. His currently focused projects are repairing and grouting of bridge and highway by UHPC in North America and China and microbial induced corrosion of concrete for sewage tunnels in Singapore.

Abstract: Foam concrete is a type of lightweight concrete traditionally applied in building industry for its thermal and acoustic insulation properties. However, in recent years, there is a surge in interest in potential applications of foam concrete as a structural component due to its low self-weight, saving in raw materials and sustainability. The main challenge for foam concrete is to have high-performance pore walls to provide required short- and long-term properties under reduced density. In this presentation, the carbon nanofibers (CNFs) enhanced ultrahigh performance concrete was used as a base mix to be blended with micro-foam bubbles to produce a lightweight cementitious composite (CNF-LCC) with 1500±50 kg/m3 density for structural use. CNF-LCC has excellent mechanical properties and bond strength with steel reinforcement compared with traditional foam concrete, which is promising for structural applications. Besides, the long-term properties including durability, shrinkage and creep resistance of CNF-LCC are superior to other normal and lightweight concrete. Furthermore, the reinforced CNF-LCC beams exhibit reliable flexural performance in both serviceability and ultimate limit states. CNFs could produce varying degrees of improvement on the material properties and structural performance due to modification of its microstructure.

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