**Advances and Challenges in Very-High-Cycle Fatigue for Metallic Materials**

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**Abstract**

Fatigue failure of metallic materials may happen at a stress below conventional fatigue limit and the fatigue life is beyond 107 cycles, which is the new research regime of very-high-cycle fatigue (VHCF). The significance of VHCF research is of two folds. On the one hand, the mechanism of crack initiation and propagation for VHCF defers from that for high-cycle and low-cycle fatigue, for which the new mechanism needs to be revealed. On the other hand, engineering structures and components, such as airplanes, high-speed trains and suspension bridges, require more than 107 cycles of safe performance. This presentation is about the newly advances and the encountered challenges in VHCF issues, which will share with you with the following parts: What is VHCF? Why VHCF is investigated? What are the essential characteristics of VHCF? What are the newly advances and encountered challenges in VHCF?

**Biography of Prof. Dr. Youshi Hong**

Youshi Hong is a Professor of the Institute of Mechanics (IMECH), Chinese Academy of Sciences (CAS). He was the Director of IMECH-CAS between 1998 and 2006. He has been the Editor-in-Chief for Fatigue & Fracture of Engineering Materials & Structures (FFEMS) since 2012*.* He was elected as an academician of Asia Pacific Academy of Materials Science in 2017.



His research fields are mechanical behavior of materials, fracture mechanics and structure mechanics. His main research achievements are related to: high-cycle and very-high-cycle fatigue behavior of metallic materials; effects of second phase particles on deformation, fracture and stress corrosion cracking of steels; analyses of stress intensity factors and plastic zone sizes for notch-cracks and fatigue crack growth from a circular notch under biaxial stress; mechanism and modeling of collective damage evolution process of initiation and propagation for short fatigue cracks; and mechanical behavior of nano-crystalline metallic materials. He has published 310 papers in academic journals and conference proceedings, and obtained 13 Chinese patents. He received a First Grade Award of Natural Science of CAS and received a National Second Grade Award of Natural Science.