Preface

Structural integrity has entered a new era due to the requirements of a long lifetime, high reliability, and light weight design for structures and components. Manufacturing of a product with high-reliability needs supports from real or virtual testing methods, from strict inspection and online monitoring techniques, and thus covers numerous manufactures and stakeholders throughout the life cycle of a product. All of these underpin the theme, “Reliability-centered Manufacturing on the Basis of Structural Integrity”, of the 2020 International Symposium on Structural Integrity (ISSI2020) held in Suzhou, October 22–24, 2020.

Reliability-centered manufacturing (RcM) aims at good quality and high reliability, pursues common progress, and refuses decoupling. It resides in the whole life cycle of a product, that is, in full consideration of the problems, malfunctions, and failures encountered in the last generation of the product, RcM requires absorbing new knowledge, and close collaboration in the development of new materials, product design, manufacturing, and operation maintenance whereby achieving higher reliability goals and realizing the iterative innovation of the product. Moreover, RcM entails digital manufacturing, intelligent manufacturing, and other efficient manufacturing modes; sharing and win-win are its core values. The theory, method, and technology of structural integrity can play an important role in every link of RcM.

More than 270 participants from China, United States, United Kingdom, Ireland, Japan, Korea, Canada, and Hongkong SAR attended ISSI2020 onsite or online, and shared deep knowledge and encouraging findings on RcM in 126 oral presentations and 33 posters. The five papers selected for the Special Topic of *Science China Technological Sciences* have been highly recommended by conference session chairs and strictly peer-reviewed by journal reviewers.

In the Special Topic, Shi and Shen present a ternary phase-field model to simulate spinodal decomposition with G-phase precipitation in the ferrite of duplex stainless steels during thermal aging. Also, considering the effect of thermal aging, Liu et al. determined the ratcheting boundary of 316LN austenitic stainless steel using an efficiency diagram rule. Qi et al. proposed a uniform compliance model for compact tensile shear specimens and developed a new compliance-based testing method to obtain fatigue crack propagation rate of mixed-mode I-II cracks. Regarding structural health monitoring, a real-time and visible method based on an organic mechanoresponsive luminogen was proposed by Zhang et al. to monitor stress distribution. Cheng et al. developed a pair of pitch-catch nonlinear ultrasonic coherent imaging techniques to selectively detect and size the microcracks.

In all, this collection brings together cutting-edge studies from scholars who are active in the field of structural integrity. We are confident that it will be of value to readers exploring the role of structural integrity in RcM involving material, design, and maintenance.

As the Guest Editors, we would like to thank all the session Chairs for their efforts to select the eligible papers as well as all the reviewers for their valuable comments on the submitted papers. Finally, we would like to thank all the authors for their excellent work, which makes great contributions to the Special Topic.

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