

Preface

Natural rock is a complicated geological medium that usually contains all kinds of fissures with unequal scales. Under an applied load, new cracks are readily initiated at the tips of nearby pre-existing fissures, and these new cracks propagate along the direction of axial stress in the rock, resulting in an unstable failure due to crack initiation, propagation and coalescence. With the increase of engineering scales and depths, strength failure and crack coalescence behaviour of rock material have become more and more important. In order to understand deeply the fracture mechanism of rock mass containing intermittent structures, in this book, a lot of experimental and numerical investigations are carried out for all kinds of rock materials containing different fissure geometries, such as a single fissure, two fissures and three fissures.

This book includes nine chapters. Chapter 1 summarises the crack evolution behaviour of rocklike materials and real rocks from the experimental and numerical viewpoint. Chapters 2–4 deal with the strength failure and crack coalescence behaviour of brittle sandstone specimen containing a single fissure, two fissures and three fissures, respectively. Chapters 5 and 6 summarise a systematical analysis on fracture coalescence behaviour of red sandstone containing two unparallel fissures under uniaxial compression by the experimental and numerical simulation. Chapters 7 and 8 summarise the experimental analysis of the effect of high-temperature heat treatments and confining pressure on the strength failure and crack evolution behaviour of pre-fissured rock material. Chapter 9 deals with a numerical investigation on the failure mechanical behaviour of red sandstone containing two coplanar fissures under conventional triaxial compression.

This book was supported by the National Natural Science Foundation of China (Grant Nos. 51179189 and 41272344), the National Basic Research 973 Program of China (Grant No. 2013CB036003), the Program for New Century Excellent Talents in University (Grant No. NCET-12-0961) and Outstanding Innovation Team Project in China University of Mining and Technology (Grant No. 2014QN002), which are greatly appreciated. At the same time, I obtained financial support from a 2014 Endeavour Research Fellowship in Australia, which was greatly appreciated. When I stayed in the Department of Civil Engineering, Monash University (Clayton

campus), Melbourne, as a visiting professor, my host supervisor Prof. P.G. Ranjith often discussed with me and brought me a lot of valuable insights, which greatly improved this research. At the same time, Prof. P.G. Ranjith made a foreword for this book, which was also greatly appreciated.

Finally, I would also like to express my sincere thanks to Prof. Hong-Wen Jing from China University of Mining and Technology, Prof. Jian Zhao from Monash University, Dr. Mike Heap from University of Strasbourg and Prof. Tao Xu from Northeastern University for their valuable comments, which have greatly improved this book. I am extremely grateful to my wife Xiao-Qin Chen for many years of personal support and understanding. I would like to thank my daughter Ai-Chen Yang for bringing me a lot of joyfulness and happiness.

June 2015

Sheng-Qi Yang



<http://www.springer.com/978-3-662-47302-3>

Strength Failure and Crack Evolution Behavior of Rock
Materials Containing Pre-existing Fissures

Yang, S.-Q.

2015, XIV, 246 p. 182 illus., 168 illus. in color.,

Hardcover

ISBN: 978-3-662-47302-3