

Preface

This book is intended as a reference book for advanced graduate students and research engineers in rock mass structural mechanics related to civil engineering, mining, etc. The term of bimrocks (bimsoils, SRM, RSA) is used to describe the mixture of fine particles and larger blocks, such as mélanges, coarse pyroclastic rocks, breccias, colluviums and alluviums, fault rocks, and conglomerates, etc. Bimrock is especially different from the general soil and rock material, and the detection of the damage and fracture is still wide open to innovative research. Globally, there is widespread interest in investigating the geomechanical behaviors of bimrocks, such as deformation and strength characteristics, damage and fracture evolution and stability prediction of bimrock construction. However, the meso-structure factors control the whole mechanical properties of bimrocks, the source of the macroscopic deformation phenomenon is the meso-structural changes. During civil or mining engineering construction, the bimrock is often exposed to complex stress disturbance, such as environmental and human-induced loading acting on rock that is cyclic in nature. Typical forms of stress disturbance include blasting vibration, earthquake, excavation, drilling and vehicle loading, etc. Usually, the stress disturbance condition is inferred as a kind of dynamic loading and differs dramatically from those under static loads. Therefore, evaluation of the mesoscopic physical and mechanical properties, together with ad-

vanced testing technique, is attractive research topics in its fatigue mechanics. As a result, comprehensive macroscopic and mesoscopic experimental investigations should be conducted to reveal the damage and fracturing mechanical behaviors of bimrock exposed to cyclic and fatigue loads.

The book is focusing on the cyclic and fatigue geomechanical behaviors of bimrock exposed to disturbed stress conditions. The book is divided into three parts. The first part, Chapters One, Chapters Two, concerns the damage evolution of bimrocks subjected to static stress paths, macroscopic mechanical tests combined with in-situ X-ray computed tomography test was employed to reveal the influence of rock structure on bimrock instability. The second part, Chapters Three, concerns the mesoscopic mechanical behaviors of rock mass under cyclic loads. A special developed loading device was designed to realize real-time CT scanning for bimrock under triaxial compressive loading. The progressive failure process was visualized from the reconstructed CT images, in addition, the meso-damage and volumetric dilatancy behaviors were revealed accordingly. The third part, Chapter Four, Chapter Five, concerns the damage and instability of bimrock from a subgrade and an open pit mine slope. Fatigue loading tests were conducted on bimrock samples with different structures, and the influence of structure on fatigue lifetime, strength, damage accumulation, failure pattern, and the associated mesoscopic failure mechanism were deeply investigated. Effort has been made to include a list of comprehensive literature citations in each chapter. However, it is impractical to list all available literature. I apologize sincerely for any omissions.

I am fortunate for having the opportunity to work with a group of excellent scholars, Prof. C. H. Li, X. Li, T. Q. Mao. In fact, most of the materials presented in this book are collections from my published papers. I wish to acknowledge J. M. Que from the Institute of High Physics, Chinese Academy of Sciences to help me perform some of the CT scanning tests. I wish to acknowledge the support and guidance of my friends.

As mentioned at the beginning, the book is intended as a reference book and not as a text. I have published one book, titled Geomechanical behavior of bimrocks in the CRC press, the book describes the static geomechanical behavior of bimrock under uniaxial, triaxial and flow stress paths. However, this book is focusing on the fatigue mechanical behaviors of bimrock subjected to complicated disturbed stress. Thus, the description of phenomena and derivation of equations may not be in depth or in detail as the reader may wish. However, if the reader obtains a clear picture and understanding of the structural-dependent fatigue deterioration of bimrocks, I would consider the book a success. It is my sincere hope that this book may inspire further research and development into this fascinating subject.

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