<<现代力学方法的技术转移与工 >

图书基本信息

书名：<<现代力学方法的技术转移与工程应用>>

13位ISBN编号：9787562825166

10位ISBN编号：7562825165

出版时间：2009-10

出版时间：华东理工大学出版社

作者：薛昌明 等主编

页数：606

前言

This book is the seventh volume of the proceedings for the symposium series on Fracture Mechanics,an annual conference devoted to the exchange of information among the universities, researchinstitutions and industry sectors in China and abroad. FM2009 is held in Chengdu, Sichuan Province,from October 16 to October 20, 2009. The first FM conference was held in 2003 at East ChinaUniversity of Science and Technology, Shanghai. Since then, the FM annual meetings have taken placeat different cities in China. This includes FM2004 in Huangshan, Anhui Province, FM2005 in Zheng zhou, He nan Province, FM2006 in Nanjing, Jiangsu Province, FM2007 in Changsha, Hunan Province and FM2008 in Hangzhou, Zhejiang Province. These annual events are indicative of the fact that the FM symposium series has played an important role in promoting information exchange,inspiring new ideas, integrating practical and research findings and breaking new grounds for the younggeneration.As the globe is evolving into a more complex world, the structural integrity technology should adaptto the challenges of complexity of the environments and the machines themselves. An examination of thetransferability and applicability of the current mechanics approaches or theories to practical applicationsshould be imperative. As is known to us, any new model or approach must successfully transit twosequential "filters" between research initiation and application, i.e. a technical filter（does it work？
）and atechnological filter （does it make sense in the "real world"？
）.However, our mechanics researchcommunity is normally not sufficiently knowledgeable concerning the metrics of the technological filterand therefore "non （application） useful" research is conducted in many cases and in others the research isnot carried far enough to allow practical applications.Aiming at bridging the gap between fundamentalresearches and applications, FM2009 brings together the mechanics research community and theapplication community to identify the transferability and applicability of current mechanics approachesfor structural integrity assessment.The symposium （FM2009） is co-organized by Southwest Jiaotong University, East China Universityof Science and Technology, National Engineering Research Center of Pressure Vessels and PipelinesSafety Technology （General Machinery Research Institute）, Nanjing University of Technology, ZhejiangUniversity, Zhejiang University of Technology, Zhengzhou University, Changsha University of Scienceand Technology and Shandong University, and co-sponsored by the Chinese Consortium of StructuralIntegrity（including members of Chinese Pressure Vessel Institution and the High Temperature Strengthof Materials Committee of Chinese Materials Institution）,Natural Science Foundation of China andGeneral Administration of Quality Supervision, Inspection and Quarantine of China.On behalf of the organizing committee, we would like to thank the above co-organizers andco-sponsors who made FM2009 possible.We also appreciate the efforts of the steering committeemembers in reviewing and selecting the papers. We are grateful for Professor George C. Sih for hisconstant support to the symposium series. We are indebted to Professor Zhengdong Wang and Dr ChiTsieh（Jimmy）Liu for their passion to the symposium and efforts made to ensure the success of the event.Special thanks are also due to the authors and speakers who make FM2009 unique.

内容概要

This book is the seventh volume of the proceedings for the symposium series on Fracture Mechanics,an annual conference devoted to the exchange of information among the universities, research institutions and industry sectors in China and abroad. FM2009 is held in Chengdu, Sichuan Province,from October 16 to October 20, 2009.

<<现代力学方法的技术转移与工 >

书籍目录

章节摘录

插图：chemical kinetics process [4]. Nevertheless, thedamage or deterioration process of material is nota simply elementary reaction. It is composed ofhighly complicated reactions of a series of dif-ferent barriers. Hence, the activation energy dur-ing the deterioration process of materials is afunction of temperature and time. This is differentfrom the preconditions of the classical Arrheniusequation. Therefore, whether Arrhenius equationis applicable to describe the deterioration processof materials under different time scales needsfurther theoretical research and experimental va-lidation [5]. There are similar bottleneck prob-lems regarding the life prediction of deformationand fracture of materials under chemical attack,which require us to understand the synergeticeffect of mechanics and chemistry [6].Another emerging issue is in life prediction thetime dependent fracture under complex stressstate or constraint. The actual engineering struc-tures or components are rather complicated. Forexample, there can be structural discontinuity,material discontinuity and load discontinuity re-quired by service functions or introduced bymanufacturing processes. The response to frac-ture of the structures can be very different fromthe behavior obtained from small specimens in the lab. On the other hand, in order to evaluate the service properties of actual structures, it isgenerally very difficult to remove a bulk materialfrom the structure. Thus non-standard specimensare machined from the structures resulting in dif-ferent constraints. Obviously the key would be todescribe the actual failure process under con-straints （under complicated stress status）. In orderto transfer the experimental results in labs to en-gineering components, lots of efforts have beentaken to study the constraint effect on fracture atambient temperature. It was recognized that thefracture toughness is no longer a constant unlessthe stress flied near the crack tip is dominated bygeneral fracture parameters （stress intensity factorK or J-integral） [7]. But in fact the structurethickness and crack dimension could hardly sat-isfy the constraint requirements near the crack tipand thus the fracture toughness tested fromhigh-constraints samples in the lab cannot be di-rectly used in engineering structures. Aiming atsuch shortcomings, a number of approaches in-cluding K-T method applicable to linear elasticfracture, J-Q theory under elastoplastic mecha-nism and three-parameter revision method, havebeen proposed [8]. Meanwhile, local approachbased on Weibull stress and some other improvedmodels have been proposed for the brittle fractureproblems of thick components [9]. However, thetime-dependent fracture under constraint effect isstill a challenge issue. Much work should be doneto quantify the time dependent constraint effect,develop the non-standard testing methods, andclarify the transferability of testing results. Anemerging issue is to develop the micro-or minia-ture specimen testing method that can be used forthe semi-destructive evaluation of service struc-tures. At present, some research work has beendone on obtaining the high-tempera~re creepproperties by using non standard specimens. Forexample, indentation test can be used to measurethe creep and fatigue properties of material （i.e.impression creep and compressive fatigue） inaddition to general mechanical properties [10].Small punch test has been well used in Europeand testing standard has been proposed [11]. Atesting method based on ring specimen that usesthe reference stress to correlate the experimentalresults with uniaxial ones has been proposed re-cently [12]. In fact, the specimens used for ob-taining the material properties of service compo-nents can be very different （as shown in Fig. 1 ！
）.Emphasis should be laid on the time-dependentdeformation and fracture theory under constraintcondition that enables the non-standard specimentest techniques [13].4. Development trends in life monitoringFrom the view point of epistemology, there areno perfect design and perfect manufacture. Toensure the safe operation, life monitoring of crit-ical industrial equipment should thus be impera-tive. At the same time, the applications of ad-vanced materials and processing technologies inhigh tech products are now common practicesthough lack of testing data and service experi-ences. An on-line life monitoring system willhelp to indentify the problems in the materialsand processing, which in turn gives feedback toimprove materials and design and manufacturebesides securing the safe operation.

编辑推荐

《现代力学方法的技术转移与工程应用:国际断裂力学2009年会论文集(英文版)》是由华东理工大学出版社出版的。