# <<应力腐蚀耦合作用下的断裂力学问题>>

## 图书基本信息

书名：<<应力腐蚀耦合作用下的断裂力学问题>>

13位ISBN编号：9787308053839

10位ISBN编号：7308053830

出版时间：2007-6

出版时间：浙江大学出版社

作者：唐志波

页数：122

## 内容概要

作者在留学美国布朗大学期间，在导师的指导下，从1997年开始从事这个领域的研究工作（主要是数值计算工作），其间获美国国家计量局陶瓷研究所的资助。
2002年完成博士论文后，作者在加州Irvine分校从事相关的博士后研究。
在此期间，作者用自己开发的软件模拟了在应力和腐蚀耦合作用下脆性材料表面微裂缝的扩展过程，同时也研究了初始裂缝在两种脆性材料（复合材料）界面时的情形。

《应力腐蚀耦合作用下的断裂力学问题》整理汇集了作者这些年的研究成果。
因为已发表的大部分文章是用英文写就的，故作者最终选择了英文作为《应力腐蚀耦合作用下的断裂力学问题》书写的语种。
限于作者的认识水平和分析能力，书中难免有不足甚至谬误之处，敬请批评、指正。

作者要特别感谢我的博士导师--布朗大学的Bower教授，和博士后学习实践期间的指导教授--美国工程院院士Atluri博士在这些年中的指导和帮助。
同时，作者要感谢浙江大学出版社编辑王镨博士为《应力腐蚀耦合作用下的断裂力学问题》出版做出的努力，以及浙江海洋学院赵秋亮老师的文字录入工作。

## 书籍目录

## 章节摘录

Usually for time dependent numerical simulation, the time step Δt must be chosen with care. Our algorithm for integrating the surface corrosion equation with respect to time is conditionally stable and the stability of the algorithm is greatly improved if the numerical parameter θ = 1 is set .Nevertheless, instabilities may be still occur if At happens to be too large. The difficulty is caused by the terms involving curvature in Eq. (2.10) : small changes in the position of the points on the void surface can lead to large changes in curvature, so small time steps must be taken to compute the rate of change of curvature accurately. The elastic fields in the solid, however, alter more slowly as the surface of the void evolves .In order to make simulation calculations maneuverable without loss of accuracy, the convergence studies by systematically testing various time step sizes through the process of computation have been conducted and finally an approach of automatic adjustment of time step size is implemented. Through convergence study (see following section), we find that, after every time step, if the maximal Ah exceeds a mesh height or more near the crack tip, the rate of convergence for the numerical solutions decreases dramatically and consequently the result becomes not reliable. If we, however, set all the time step sizes too small, it turns to be not practical due to the very long time needed for computation. Then we enable the code to adjust time step size automatically by monitoring Ah. if the maximal Ah is around 30%~40% of its corresponding mesh size after one time step, computation for next time step will be allowed to continue. Otherwise, the code will adjust time step size correspondingly and re-compute this step till the maximal Ah match the criteria above. For calculation of next time step, this new adaptive time step size will be first tried and automatic adjustment of time step size will be re-activated if necessary. This procedure is repeated through computing the progressive change in shape of the void.Meanwhile, we have devised a re-start function in this FEM code. Usually in time dependent simulation, computation could be terminated unexpectedly for some reasons such as mesh construction problem due to the complicate geometric shape on the boundaries, etc. It is, however, not necessary to resume the calculation from the initial step if the results of first many steps are assured to be acceptable. We may write the information of all variables during the calculation into a file that is named as re-start file.