Seminar

01. Juli 2010 16:30h HS 44-465

Technische Universität Kaiserslautern

zu folgendem Vortrag wird herzlich eingeladen:

Wave propagation in cracked piezoelectric solids by BIEM

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Piezoelectric materials (PEM) are extensively applied in many modern technological fields due to their coupled electro-mechanical nature. At the same time their brittleness make them very sensitive against defects like cracks or other type of geometrical imperfections obtained during manufacture processes. The understanding of the fracture process of PEM can provide useful information to improve the design of the electromechanical devices or to predict their lifetime. The present work is an effort in this direction. The main aim of this study is to propose, develop and validate an accurate and efficient boundary integral equation method (BIEM) and apply it for solution of plane dynamic fracture electro-mechanical problems for cracked piezoelectric solids. The modeling approach is based on the frame of continuum mechanics, linear wave propagation theory and linear fracture mechanics. The computational tool is non-hypersingular traction BIEM based on frequency dependent fundamental solution. The obtained results reveal the sensitivity of the dynamic stress and electric field concentrations near the crack tips to: (a) structure and crack geometry; (b) type of the electrical boundary condition; (c) coupled character of the electromechanical continuum; (d) type and characteristics of the dynamic load; (e) type of material- its anistropy, inhomogeneity and electro-mechanical coupling; (f) wave-crack, crack-crack and wave material interaction. The application of the near-field results is in computational fracture mechanics, while the information for the scattered wave field can be used for development of new efficient non-destructive test methods for monitoring the integrity and reliability of the multifunctional materials and the smart structures based on them.

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