DTU Library

Simulation of kink-band formation in fiber reinforced composites

Mikkelsen, Lars Pilgaard

Publication date:
2008

Citation (APA):
Mikkelsen, L. P. (2008). *Simulation of kink-band formation in fiber reinforced composites*. Abstract from Seminar at Australian Composite Structures Society, Melbourne (AU), 2nd Sep.

Simulation of kink-band formation in fiber reinforced composites

Senior Scientist Lars P. Mikkelsen, Material Research Department, Risø National Laboratory for Sustainable Energy, Technical University of Denmark, Roskilde, Denmark.

For high strength carbon fiber reinforced polymers, the design criteria are often specified by the compression strength of the composite component. This is due to the fact that the compression strength of unidirectional composites is as low as 50 to 60 percent of the tensile strength. One important compressive failure mode in composite is kink-band formation which for a great deal is governed by the waviness of the fibers and the yielding properties of the matrix material. Therefore, in order to make proper simulation of the failure modes in composites, it is necessary to take these effects into account. One approach is to model the actually fiber/matrix system using a micromechanical based finite element model. For realistic composite structures with large number of fibers, approaches which will result in extremely large numerical models including a great deal of unwanted details. An alternative is to base the simulation on a smeared out composite model where the nonlinear properties of the constituents are taken into account. A finite element implementation of such a model is presented. The model are implemented as a Umat user subroutine in the commercial finite element program Abaqus and used to predict kink-band formation in composite structures.

Time: 11:00 to 12:00, Monday, 2 September 2008.

Senior Scientist Mikkelsen obtained his M.S. and PhD in Mechanical Engineering at the Department of Solid Mechanics, Technical University of Denmark. He has been on a Carlsberg-Clare Hall visiting fellowship at Cambridge University Engineering Department, UK and as a visiting scholarship at Harvard University, US. He has in the last 7 years been attached as a senior scientist at Material Research Department, Risø DTU, a department under the Technical University of Denmark. Senior Scientist Mikkelsen's research is focused on finite element modeling including non-linear material and geometrically properties. He is currently working with strain gradient dependent plasticity models, crack growth predictions, mechanical characterization of polymers, kink-band formation in composites and numerical simulation of biomechanical inspired problems.