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CRACK PROPAGATION ANALYSIS IN THE MEDIA WITH RANDOM STRUCTURE BY FINE MESH WINDOW TECHNIQUE

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ABSTRACT

Presented paper contains crack propagation analysis of the composite materials with random grains distribution. The composite structure has been modelled as an isotropic matrix that surrounds grains with random geometry or porous media (Fig. 1). Analyses have been preformed for rectangular and CT specimen modelled by finite elements. These models were generated using the authors' computer program *RandomGrain*. Fracture analyses were realized with the authors' computer program *CrackPath* with moving "fine mesh window" technique. The rectangular specimens were subjected to uniform tension stress state. CT specimen was subjected to standard tension test. Calculations were preformed in 2D space assuming the plane stress state. Obtained results are going to be used in ongoing work on a computer code which will be used for composite material analyses.

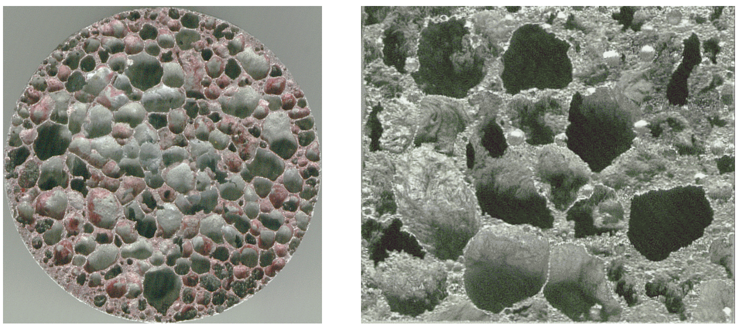
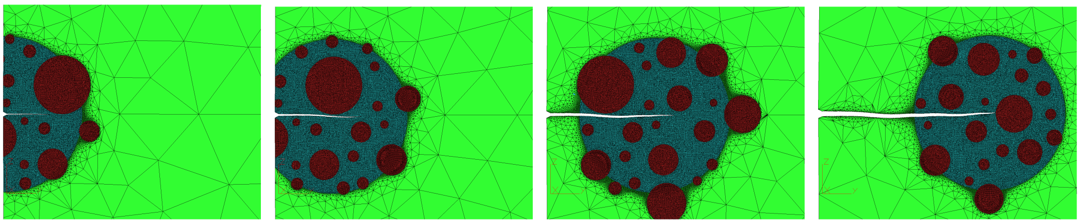


Figure 1: Structure of aluminium foam

Crack propagation analysis was realized with the author's computer program *CrackPath* with moving fine mesh window. This technique relies on generation of the fine mesh window near crack tip and coarse mesh far from crack. Inside the window, material geometry is modelled so exactly as it possible, but material positioned outside of window is modelled as homogeneous with elastic moduli calculated with homogenisa-

tion procedure. Fine mesh window is moved with crack tip in each calculation step or several crack propagation steps is calculated with this same window (Fig. 2).



A B C D

Figure 2: Crack path calculation with 4 fine mesh windows

This simple remeshing procedure considerably decreases (3÷4 times) the size of numerical problem related with node number of the finite element model. Figures 2 and 3, shows results of the crack path calculation with four fine mesh windows. Mesh generated for model C (Fig. 2C), contain 42326 nodes. This mesh density allows execution 80 computational steps (Fig. 3).

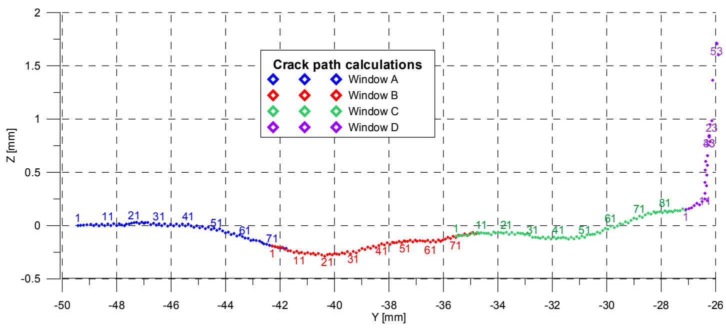


Figure 3: Crack path calculated with 4 fine mesh windows

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