International Conference "Mathematical Modeling and Computational Physics, 2017" (MMCP2017)



Contribution ID: 114

Type: not specified

Features of plastic flow localization in hollow cylinder

Thursday, 6 July 2017 14:30 (15 minutes)

The process of plastic flow localization in hollow cylinder which is made from high-strength steel undergoing the torsion deformation is considered. The mathematical model of the process of plastic flow localization is formulated taking into account the cylindrical symmetry of the problem. The transition of the proposed model to a mathematical model describing the processes of plastic flow localization in the plane case is discussed. Numerical algorithm which allows one to simulate the fully localized plastic flow in cylindrical case is proposed. The influence of the geometry of the problem on the processes of plastic flow localization is considered. In particular, the effect of the value of the internal radius of the cylinder on the processes of localization of plastic deformation is studied. It was found that a decrease in the radius of the inner cylinder leads to a substantial change in the solution and to the displacement of the region of localization of the deformation to the inner surface of the hollow cylinder. The effect of nonuniform heating of the sample on the localization of plastic deformation is also investigated. The obtained results are compared with the limiting case, namely, the process of localization of plastic deformation under shear deformations of the plate.

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Session Classification: Mathematical methods and application software for modeling complex systems and engineering (III)