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Investigation of Couple-Stress Effects in Elastic Bodies Under Deformation

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One of the criteria for estimation of the applicability of the asymmetric elasticity theory is the availability of problems solved in the framework of this theory, which makes possible the corresponding experimental realization. In this work new analytical solutions to the following problems of asymmetric elasticity theory are presented. To extend the scope of problems to be solved the finite element method algorithm has been developed for solving two-dimensional problems of asymmetric elasticity theory. Numerical solutions are found for several problems in which couple effects are more pronounced than in the problems with realized analytical solutions. In this work, a series of experiments have been performed. The experimental schemes of material deformation are constructed based on the Kirsh problem of the infinite plate extension weakened by a circular hole. The experiments performed for different hole diameters have provided much evidence in support of couple-stress behavior of materials under deformation.

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