

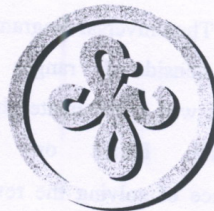
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BOOK OF ABSTRACTS

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A METHOD FOR DETERMINING THE ELASTIC MODULUS OF POLYMER MATERIALS BY USING THIN-WALLED CYLINDRICAL SPECIMENS

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The method of determination of the elastic modulus is based on a solution to the problem of compression of a thin-walled circular cylindrical tube by two parallel planes. The contact problem is solved by the finite-element method. The deformation of a thin polymer shell is characterized by great displacements and relatively low elastic deformations in a large range of movement of parallel planes.

As an example, a circular shell 40 mm in diameter and 50 mm long was considered. A number of loading diagrams were obtained for thicknesses in the range 0.05–0.25 mm and elastic modulus within 500–5000 MPa. By choosing infinite values for the load and displacement, all the calculated curves were reduced to a unified universal loading curve. The universal diagram of loading within the considered ranges of thicknesses and modulus was approximated by a sixth-power polynomial. Based on this dependence, the sequence of solving the reverse

problem of determining the elastic modulus from the experimentally obtained force–displacement curve was recorded. This method was employed to calculate the elastic modulus for a series of experimental specimens consisting of seven polymer compositions, whose elastic modulus have been found earlier via standard tension tests. The good correspondence between the results confirms the efficiency of the given method.

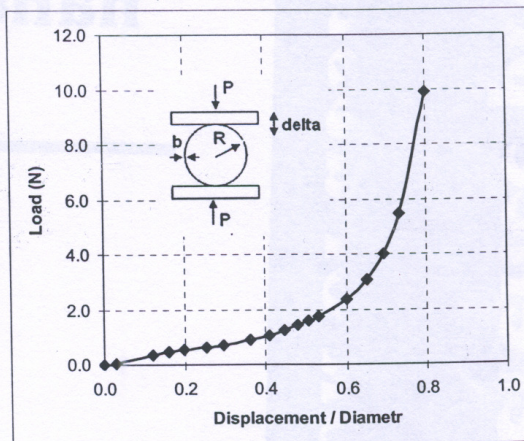


Fig.1 Force–displacement dependence