General plane elastic and yielding states in anisotropic solids(*)

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THE PAPER concerns elastically and plastically anisotropic solids.

In the range of linearly elastic deformation, the relation between stress and strain tensor has the form of the generalized Hooke's law. The fourth order tensor specifying the material stiffness can be treated as a linear transformation of a second order symmetrical tensor space into itself.

In this paper, the case is considered when this fourth order tensor transforms symmetrical tensor in the plane tensor.

A tensor is called plane in n-meaning if the direction n is the eigenvector for this tensor with zero eigenvalue. All tensors plane in n-meaning constitue a linear space.

Many different cases are considered. It seems to be the most interesting to find those symmetrical tensors of the second order which, by the given anisotropy, are transformed into plane tensors.

In the paper the classes of such tensors are specified for the cubic and transversal isotropy.

Further considerations are connected with the yielding state. The quadratic yield condition of Huber–Mises–Hencky type is assumed.

It was proved by Rychlewski that such quadratic yield condition has the energetic meaning. It is possible to decompose the state of stress in such a way that the yield condition is represented as a sum of the terms, each of them having a determined energetic interpretation.

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In the present paper this kind of decomposition is found for the cubic and transversal isotropy.

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