THE CHANGE IN THE ARRANGEMENT OF THE STRESSED STATE OF A SOLID UNDER THE ACTION OF HYDROSTATIC PRESSURE*

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According to the paper by Ryabinin [1], one of the main reasons for the increase in plasticity of a metal specimen under the action of a high hydrostatic pressure is the change in the arrangement of the stressed state. However, the qualitative picture of the extension under pressure given in his article does not fully reflect this change: in the first place, because the example given refers to a two-dimensional specimen and, in the second place, the case is not considered where the hydrostatic pressure is equal to or exceeds the tensile stress applied to the specimen. This restricted view of the problem lead the author of the article [1] to the conclusion that a uniaxial extension at atmospheric pressure is converted into an axial extension, accompanied by a strong lateral compression, under high hydrostatic pressure. This arrangement is not revealed before the end of the qualitative jump – the disappearance in the specimen of tensile stresses.

Considering a similar arrangement for the case of a three-dimensional specimen with the application of a hydrostatic pressure p, equal to or exceeding the tensile stress σ, then it can readily be shown that at a pressure $p = \sigma$, the uniaxial stress is replaced by a biaxial compression, and at a pressure $p > \sigma$ – uneven compression on all sides.

When testing specimens for tension under hydrostatic pressure, three arrangements of the stressed state are therefore possible:

1) $p < \sigma$ – the case considered by Ryabinin, – the hydrostatic pressure is completely taken from the specimen by the tensile stress. The specimen is subjected to an axial tensile stress equal to $\sigma - p$ in one direction and compressive stresses equal to p in the other two directions;

2) $p = \sigma$ – there are no tensile stresses in the specimen, the hydrostatic pressure is removed. The specimen is subjected only to compression on two sides;

3) $p > \sigma$ – there is compressive stress on two sides, equal to σ and hydrostatic pressure equal to the difference $p - \sigma$. There are no tensile stresses.

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REFERENCES

1. Yu. N. Ryabinin, *Fizika tverdogo tela,* 1, No. 6, 960, (1959).

* *Fiz. metal. metalloved.*, 9, No. 1, 155-156, 1960.