CORRELATION PLASTICITY OF METALS AND ALLOYS WITH THE MAGNITUDE OF THE SURFACE TENSION ENERGY.

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The problem of strength of materials - one of the most important problems in condensed matter physics. It occupies a dominant position in relation to the creation of functional materials of new generation, as in this case, the safe operation of the latter requires a certain reserve of strength and resistance to static and shock damage.

Since UV Milman and BA Galanova been developed theoretical foundations of the characteristics of plasticity - δn, which is determined by the specific conditions of the local loading of the indenter [1]. For most materials, for which $\delta_n > 0.3$-0.4, for example, for all metals and metal alloys can be used a simplified expression

$$\delta_n = 1 - 14{,}3(1 - \nu - 2\nu^2)\frac{HV}{E}, \qquad (1)$$

ν – Poisson's ratio;
HV – hardness (GPa);
E – Young's modulus (GPa).

Determination of δn has allowed to compare the number of plasticity of brittle materials.

The aim is to establish a correlation of plasticity of metals and refractory materials with the energy of the surface tension (EST).

In the laboratory composite of Institute of material science FEB RAS so far subjected to the study the following list of powders of metals and alloys: Ni; Fe; W; Co; Cr3C2; WC *; WC; B4C; TiC; for these materials are found the estimated values of surface energies (Fig 1)

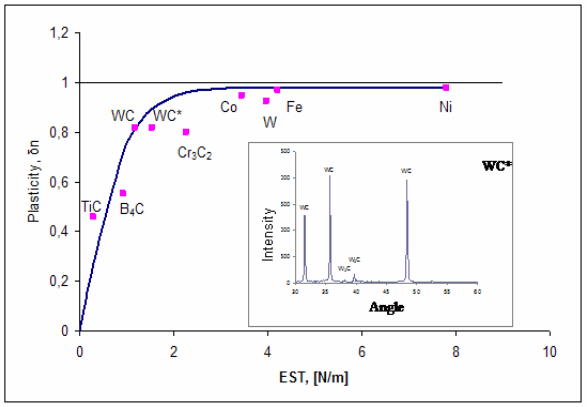

Fig 1. A plot of the plasticity of metals and carbides on the surface tension energy.

After computer processing of data obtained by the algebraic expression of the quantitative relationship between the δn-σ

$$\delta_n = 0{,}98th\sigma\ ,\ R^2 = 0{,}885, \qquad (2)$$

R^2 – index of determination.

Conclusion

1. We find a quantitative relationship of plasticity of metals and alloys with super energy of the surface tension corresponding to the regression equation (2).
2. It is shown that the determination of the index-σ relation δn meets physical experiment and equal to the value - 0.885

References

1. Inorganic Materials. Fundamentals of materials science. Encyclopedic Edition. Volume 1 / ed. VV Skorokhod and GG Gnessin. - Kiev: Naukova Dumka, 2008. With 1152.