The influence of silicon on the boride coatings formation

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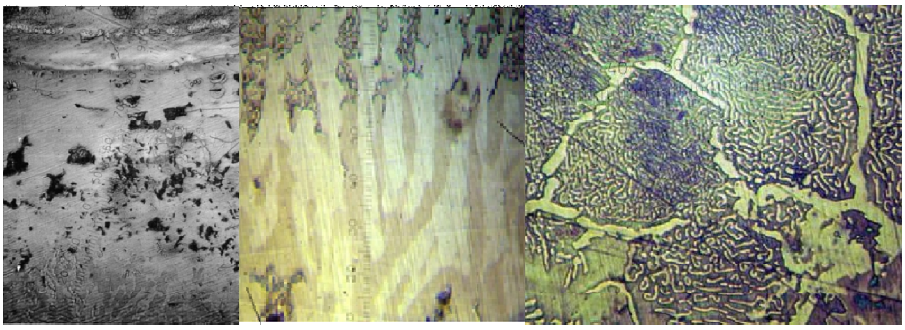
The peculiarity of the diffusion zone structure, consisting of boride needles, placed in a more plastic matrix of silicide phases, cause high wear resistance borosilicate coatings on steels. With increasing of the silicon-containing component in the saturating **mixture**, the thickness of the diffusion layer decreases. In addition, the increasing of the silicon alloying in the diffusion layer leads to the formation of a significant number of fragile silicide phases distributed under boride, boride and over boride areas and to the stratification of borides borosilicate layer and reduce its strength.

In the work an influence of silicon on the boride coatings formation on steel at chemical-thermal treatment (ChTT) in the powder **mixture** containing boron, molybdenum and silicon are investigated.



a) x250 b) x1000 c)x1000

Fig. 1 The microstructure of the diffusion layer on steel after ChTT.

The diffusion layer with depth from 400 to 550μm (Fig.1, a), including branched boride layer with formation of eutectoid (Fig. 1, b) and the underlayer, with the typical structure for concentration inhomogeneity peritectic of Fe-C-Si-B with the possible presence of Mo (Fig.1, c) are formed in the saturation. The layer contains inclusions with microhardness of 15-16GPa, and, in addition, the zone with depth of 10-20 μm and hardness of 6,6 GPa formed on the border with matrix. Besides diffusion of the components (Mo, Si) in the diffusion layer is their redistribution in the newly formed boride phase according to the principle of least action. At this stage of saturation microinclusions of iron compounds with diffusate (double and triple phase) located mainly on the boride phase (FeB) boundaries and interphase boundaries are formed.

Thus, the presence of silicon and molybdenum in the saturating mixture produces on the surface of the steel a multiphase composite structure of microcrystalline inclusions of compounds Si and Mo with boron and iron that provides high hardness and heat resistance, resistance to brittle fracture, wear resistance in a wide temperature range.