m19.p09

Structure and phase transitions of some crystals in the system Fe-WC-Me after discrete plasma influence

A. Ilyasov[a], A. Ryzhkin[a], V. Ilyasov[a]

[a] *Don State Technical University, Gagarin Sq.,1, Rostov-on-Don, 344010, Russia, e-mail: aleil@mail.ru, viily@mail.ru.*

Keywords: crystal structure and properties, phase transitions, X-ray diffraction

Tungsten carbide is one of the most interesting representatives of the highest groups of the transition metals carbides which can have either hexagonal (WC) or cubic (NaCl type) crystallographic modifications. By means of X-ray diffraction analysis it was ascertained that after discrete plasma influence (T ~ 20000 K, τ = 0,6 sec) in system "Fe - WC - Me" (Me = 3d-metal) a crystal structure of hexagonal WC transits into a superlattice of Fe_3W_3C ($E9_3$) and into some double carbides as well, in particular into FeW_3C and Fe_6W_6C. Instability reason of the tungsten carbide crystals is referred to tungsten carbide solution in iron matrix [1]. However nowadays in the studied problem a full representation about the structural-morphological characteristics and the products properties of the solid-phase chemical reactions doesn't exist. In the tungsten carbide structure the atoms of tungsten have coordinating polyhedron (CP) $\{WC_6W_8\}$, the atoms of carbon - CP $\{CW_6\}$ [2]. In the superlattice of Fe_3W_3C the atoms of tungsten have CP $\{WFe_3C_4W_8\}$, the atoms of carbon - CP $\{CFe_3W_{12}\}$, the atoms of iron - CP $\{FeCW_3Fe_8\}$. At the room temperature in the hexagonal tungsten carbide a shortest length of W-C bond (**r**) amounts 2,220 Å and in the superlattice of Fe_3W_3C **r** ~ 3,064 Å.
For understanding of the properties formation regularities of the above mentioned system in published literature it is not enough data about the features of the chemical bond and the changes in an electronic energy structure of the tungsten carbides in the metal-matrix composites (MMC) in process of precipitation into the steel melt in plasma bourne and fast air quenching. Therefore in the given work the electronic structure and a chemical bond character of the above mentioned carbide compounds are studied. A cluster version of a local coherent potential method was used which was already applied for a wide range of the different materials [3].
A complex investigation of the crystal and electronic structures of the given system permits to understand the formation rules of new materials physical properties.

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m19.p10

Structural aspects of solid state amorphization in single crystalline samples of $Eu_2(MoO_4)_3$

Elena Kudrenko[1], Ivan Shmytko, Vitaly Sinizyn, Evgeny Ponyatovsky

Institute of Solid State Physics RAS, 142432 Chernogolovka, Moscow district. E-mail: lenak@issp.ac.ru

Keywords: rare-earth compounds, high-pressure amorphization, X-ray diffraction

The samples of $Eu_2(MoO_4)_3$ has been investigated by X-ray diffraction method. These samples have been subjected high pressure 9 GPa at room temperature. It was established that powder samples undergo at this pressure solid state amorphization. At consequent annealing with temperature increasing unusual sequence of phase states have been observed. Instead of expected "amorphous" $\rightarrow\alpha\rightarrow\beta$ sequence the "amorphous" $\rightarrow\beta\rightarrow\alpha\rightarrow\beta$ sequence come to pass.
The single crystalline samples in contrast to polycrystalline ones do not undergo solid state amorphization. In this case phase transition from tetragonal β-phase into a new tetragonal high-pressure phase take place. We have shown that in the case of incomplete phase transition "β- phase- high-pressure phase" two phase state has been characterized of existence of wide interphase boundaries. The parameters along the boundaries change continuously from one into other phase. In the case of complete phase transition into high-pressure tetragonal phase at subsequent annealing instead of narrow diffraction reflection halo-like reflections were observed. On the base of these results we have supposed that no amorphization in polycrystalline samples take place. The halo-like reflections in this case characterize the transitional state between high-pressure phase and β-phase, namely the diffraction from the set of transitional boundaries.
The work was supported by RFBR N° 04-02-017143, 05-02-08302 and 06-02-17298.