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INVESTIGATION OF THE INTERACTION OF TUNGSTEN BORIDE (W_2B) WITH IRIDIUM*

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Interest in the study of ternary systems consisting of transition refractory metals and platinum group metals has grown significantly recently. Compounds in W-M-B systems (where M = platinum group metal) have a set of valuable properties, including high thermal and oxidative stability, high hardness, superconductivity, therefore they are in demand in various fields of modern materials science. Ternary boride systems based on tungsten and iridium are of particular interest, since iridium has a high melting point (2446 °C) and a low rate of recession in oxygen at temperatures above 2000 °C.

The aim of this work is a physicochemical study of the interaction of iridium and tungsten boride W2B in the temperature range of 1000 – 1600 °C.

To study the interaction, Ir/W_2B diffusion pairs and mixtures of iridium powder and W_2B were prepared in a molar ratio metals of 1:1 and 3:1, which were heated to a predetermined temperature in the range of 1000 – 1600 °C in an inert atmosphere. The phase and elemental composition, as well as the morphology of the products were studied using X-ray phase analysis and electron scanning microscopy at various accelerating voltages. This made it possible to identify both heavy (W and Ir) and light (B) elements.

Using XRD, it was found that the interaction between Ir and W2B becomes noticeable at 1100 °C, while $IrB_{1.1}$, intermetallic compound of variable composition WxIr1-x and unreacted initial phases were detected. With an increase in temperature to 1200 °C and above, phases W_xIr_{1-x} (x = 0.33), $W_2Ir_3B_{6-x}$, WB, IrB1.1 were detected in the products. In addition, reflexes are present in the radiographs that cannot be attributed to any known phase of the W-Ir-B system. The SEM/EDX data (Fig. 1) confirm the results of the XRD. In addition to the phases already mentioned, a double boride of the assumed composition $W_2Ir_5B_2$ was detected using SEM/EDX.

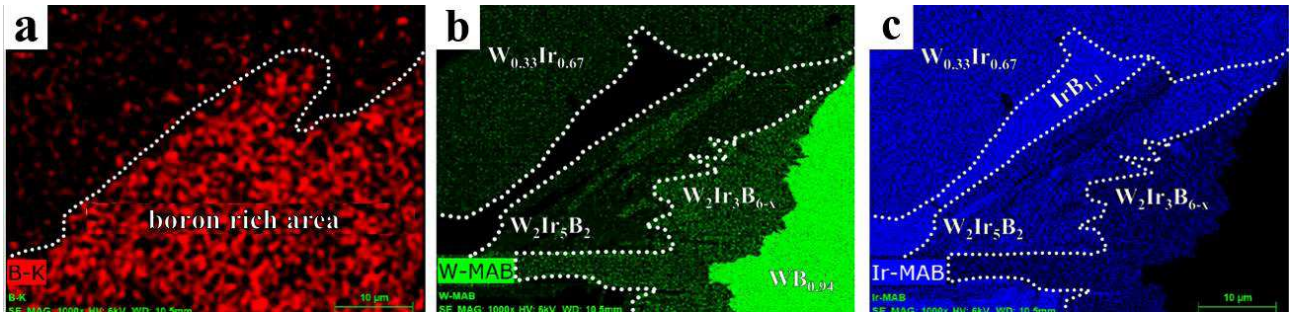

Fig.1. Mapping by cross–section elements of a powder mixture of iridium and tungsten boride (3:1) heated at 1600 °C: a – boron, b – tungsten, c – iridium.

Thus, it is established that the phase composition of the products of interaction of iridium with tungsten boride (W2B) depends on the ratio of components and temperature. At elevated temperatures in the W-Ir-B system, when W2B interacts with iridium, along with iridium boride ($IrB_{1.1}$) and intermetallic compound (W_xIr_{1-x}), WB and double borides are also formed.

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