Electrochemical Synthesis of Binary Carbides of Tungsten and Iron (Nickel, Cobalt) in Halide-Oxide Melts at 823 K

Hasbi Kushkhov, Marina Adamokova, Vitalij Kvashin, Anzor Kardanov, and Svetlana Gramoteeva

Kabardino-Balkarian State University, Nalchik, Russia

Reprint requests to M. A.; E-mail: adamokovam1@yahoo.com

Z. Naturforsch. **62a,** 749 – 753 (2007); received March 5, 2007

Presented at the EUCHEM Conference on Molten Salts and Ionic Liquids, Hammamet, Tunisia, September 16 – 22, 2006.

Iron, cobalt and nickel powders are used as binding components for the production of articles of tungsten carbide by the hot pressing method. This fact and the unique properties of binary carbides of tungsten-iron triad metals encouraged the search for new ways of their synthesis. In the present work, the attempt to synthezise binary tungsten-nickel (cobalt, iron) carbides in molten KCl-NaCl-CsCl at 823 K was made.

As a result of voltammetry research, it was established that in eutectic KCl-NaCl-CsCl melts the deposition potentials of W and Ni (Co, Fe) differ by 150 – 350 mV from each other, which makes their co-deposition difficult. It is possible to shift the deposition potentials of tungsten and metals of the iron triad metals towards each other by changing the acid-base properties of the melt. The products of electrolysis in these molten system were identified by X-ray analysis. They are mixtures of tungsten and nickel (cobalt, iron) carbides: Ni_2W_4C, $W_6C_{2.54}$; Co_3W_3C, Co_6W_6C, W_2C, Co_3C; FeW_3C.

Key words: High-Temperature Electrochemical Synthesis; Binary Carbides; Voltammetry; Molten Halides.