METHOD FOR the PRODUCTION OF W, Co, Ti AND V METAL PRECURSORS

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In this work, we propose a method for synthesis of precursors - nanocomposites of W, Co, Ti and V metals by adsorption of metal oxyhydrates on a solid adsorbent (carbon black) from salt solutions. It was established that neutralization of acid and alkaline solutions of metal salts in the presence of a sorbent gives rise to powder-like composites consisting mainly of a mechanical mixture of metal oxyhydrate and sorbent nanoparticles. At the initial stage, we were solving the problem of complete precipitation of metals from salt solutions into the precipitate depending on the concentration of the mother solution, the temperature and pH of the medium in the presence of the sorbent.

Comparative study of the morphology of the precursor particles produced with and without sorbent was carried out with the use of a scanning electron microscope. It was found that tungstic acid crystallized in the form of plate-like particles, and in spherical approximation their diameter was as large as 200 nm and the thickness of the plates was within the interval 10-50 nm. The specific surface of the samples varied from 25 to 100 m²/g depending on the synthesis conditions. Cobalt hydroxide produced from nitrate solution featured flaky precipitates consisting of thin plates with a diagonal of less than 150 nm, thickness of 10-30 nm and specific surface of 170 m²/g. The titanium precursors were produced from an aqueous solution of titanyl sulfate. The titanyl hydroxide particles had a spherical shape with a diameter of 180 nm, whereas the specific surface of the sample and microporosity could change considerably from 100 to 600 m²/g depending on the synthesis conditions. The samples of vanadium hydrate were found to contain plate- and thread-like particles with thickness and diameter ranging within 15-100 nm and specific surface of 25-40 m²/g. Besides, the particle size and quantitative size distribution were estimated by the planimetric method using the SEM photographs. The basic chemical composition of the samples was determined by thermogravimetric method and X-ray phase analysis.

The W, Co, Ti and V precursors produced on a carbon carrier are used generally for synthesis of carbide phases and for the production of tungsten hard alloys and cutting tools based thereon.

Keywords: Precipitation, Carbon, Precursors

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