Synthetic Sorbent Materials Based on Metal Sulphides and Oxides

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First published 2021

ISBN: 978-0-367-56675-3 (hbk)
ISBN: 978-0-367-60875-0 (pbk)
ISBN: 978-1-003-10233-5 (ebk)

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There are no doubts that sorption materials have wide perspectives of application in contemporary complex systems of water treatment. Modern trends of their development are dependent on the need of appropriate water supply, necessary for life of present and future generations. Thus, the main problem of the technological systems is to work out ecologically safe technologies with minimal amounts of wastes. The researches are focused on the improvement of existing materials and development of new ones of high sorption efficiency. These materials are to be used in complex and selective processes of wastewater treatment in the context of ecology, energy, and resource savings, as well as social life.

One of the solutions leading to achievement of proper materials is the development of methods of controlled synthesis of particles with presumed desirable characteristics. New technologies can be developed after thorough analysis of a wide range of factors that have effect on the particles structure and morphology formation, such as temperature, pH, composition, activation method, and so on. These technologies may be applied also to production of other materials, not only for sorption purposes.

Physical and chemical characteristics of the metal sulfides, iron oxides, and manganese oxyhydroxide allow their application as sorbents. They may be used for heavy metals and radionuclides uptake from wastewater practically down to any residual concentration at pH above 5. The controlled inorganic synthesis allows forming of sorbents particles with certain morphological characteristics, which effects with increase of sorption capacity even several times.

It appears to be the most promising to apply manganese oxyhydroxide as a sorbent. It is able to uptake heavy metal ions and radionuclides with high efficiency above 95% (Sofronov et al. 2019), including isotopes ^{90}Sr and ^{137}Cs (Krasnopyorova et al. 2017), and perform higher sorption capacity than that of metal sulfides and iron oxides.

The research results presented in this work are aimed on the controlled synthesis of inorganic particles with presumed structural, morphological, and functional properties.

Acknowledgments

The authors express their gratitude for cooperation to everybody who contributed to the researches, especially to chemistry doctors Baumer V.N. and Puzan A.N. for X-ray structural analysis, to Bunina Z.Yu., Gudzenko L.V., and

chemistry doctor Shcherbakov I.B.-Kh. for chemical analysis, to Mateichenko P.V. for microstructural analysis, to chemistry doctor Beda A.A. for specific surface determination, and to physics and mathematics doctor Katrunov K.A. for optical researches.

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