# Nano- and microsized structures in metamorphic processes, reducing firing and component separation of iron oxide silicate materials

**V.A. Oliinyk[1], A.V. Panko[1], I.G. Kovzun[1], E.V. Ablets[1], E.M. Nikipelova[2]**

[1] *F.D. Ovcharenko Institute of Biocolloid Chemistry, NAS of Ukraine, 42, Ak. Vernadskogo Blvd., Kyiv 03680, Ukraine e-mail: gr.k.ibcc@ukr.net*

[2] *Ukrainian Research Institute of Medical Rehabilitation and Balneology, Ministry of Health of Ukraine, 6, Lermontovskiy Lane, Odessa 65014, Ukraine*

Dependences between mechanochemical, nanochemical and microbiological processes of rock metamorphism into nano- and microsrtuctured iron oxide silicate materials with processes of their further processing, separation and application were determined using advances in physicochemical geomechanics, colloid and biocolloid chemistry, X-Ray diffraction, thermographic, electron microscopic, rheological and microbiological methods. Metamorphic processes on interim stage are also flowing providing formation of nanostructured pelagic sediments aided with microorganisms and their surface active methabolites. Optimal effective ways of nanostructured sedimentary iron oxide-silicate rock reducing firing process and separation of received components were determined. It was established that for iron ores contaminated with silicates, phosphorus and arsenic the maximal extraction of arsenic and its separation from phosphorus can be achieved by catalytic solid-phase carbide transformation of iron oxide at 600-980 ºC. The latter goes simultaneously with reduction magnetite formation process and transformation As (V) compounds into As (III), for example by next scheme:

$$Fe_2O_{3(micro)} + C_{(nano)}\ (CO,H_2) \rightarrow Fe_3O_{4(micro)} + CO(CO_2,H_2O)$$

$$Fe_2O_{3(micro)} + C_nH_{2n} \rightarrow Fe_3C_{(nano)} + CO\ (C_{(nano)}) + H_2$$

$$Fe_3C_{(nano)} + FeAsO_{4(micro)} \rightarrow Fe_3O_{4(micro)} + FeAs_2O_{4(nano)} + C_{(nano)}$$

1. *Panko A.V., Ablets E.V., Kovzun I.G. Chemical transformations of nanoparticles during mechanochemical dispersion of sponge iron // "Nanotechnology and Nanomaterials" (NANO-2014), Yaremche-Lviv, Ukraine, Book of Abstracts, 2014. – P. 58*
2. *Panko A.V., Ablets E.V., Kovzun I.G., Ilyashov M.A. Wasteless Solid-Phase Method for Conversion of Iron Ores Contaminated with Silicon and Phosphorus Compounds // Engineering and Technology International Journal of Chemical, Materials Science and Engineering. 2014. – P. 35-37*