

Hou [et al.] // Rock mechanics and rock engineering. – 2015. – №48(6). – P. 2421 – 2433.

5. Gao F.Q. Effect of pre-tensioned rock bolts on stress redistribution around a roadway – insight from numerical modeling / F.Q. Gao, H.P. Kang // J China Univ. Min. Technol. – 2008. – №18(4). – P. 509 – 515.

6. Systematic monitoring of the performance of anchor systems in fractured rock masses / HY. Sun, LNY Wong [et al.] // Int. J Rock Mech. Min. Sci. – 2010. – 47(6). – P. 1038 – 1045.

7. Jayanthu S. Behavior in Development and Depillaring workings supported with Roof Bolt and Cable Bolts / S. Jayanthu, V. Venkateswarlu // Strata, Short Term Course on – Trends in Strata Control Techniques & Instrumentation for Enhancing Safety in Coal Mines, 28 – 31 July 2008. – Mining Dept. NIT Rourkela. – 2008. – P. 145 - 153.

EVOLUTION OF THE MICROSTRUCTURE OF MINERAL SYSTEMS IN ELECTRIC AND MAGNETIC FIELDS OF WEAK INTENSITY

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Purpose. Study of phase and structural effects in solid mineral systems caused by the development of spin-selective chemical reactions initiated by the action of a weak magnetic field.

Methodology. Experimental studies of the influence of weak electric and magnetic fields were carried out with the aim to establish regularities of microstructural and phase transformation in solids. Numerical modeling involving quantum mechanical regularities were adapted to estimation of energy changes of chemical bond. Raman spectroscopy, electron paramagnetic resonance, nuclear magnetic resonance, infrared spectroscopy, thermogravimetric analysis and differential scanning calorimetry, laser diffraction analysis of particle sizes, etc. were used for physiochemical studies.

Findings. The effect of an abrupt decrease in the electrical resistance of siderite upon heating and the simultaneous action of a weak current and the action of a weak magnetic field is established. The jump in resistance is due to spontaneous formation of a new carbon phase, mainly with an electronic type of conductivity. The action of a weak magnetic field on hard coal leads to an increase in the C:H ratio by 3-7%, a decrease in volatiles by 8-10%; increase the size of microparticles of crushed coal by 35-55%. These changes in composition can be interpreted as one of the possible chemical acts of coalification. The action of an electric field on coal leads to the contrary result, including the stimulated gasification of coal.

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Key words: siderite, calcite, coal, magnetic field, phase transitions, chemical reactions

References

1. Buchachenko, A.L. (1995). The nuclear-spin selectivity of chemical reactions. *Russ. Chem. Rev.*, 64(9), 809–816.
DOI: <https://doi.org/10.1070/RC1995v064n09ABEH000177>
2. Buchachenko, A.L., Berdinsky, V.L. (1996). Spin catalysis of chemical reactions. *J. Phys. Chem.*, 100, 18292.
3. Buchachenko, A.L. (1999). Chemistry on the border of two centuries – achievements and prospects. *Russ. Chem. Rev.* 68(2), 85–102.
DOI: <https://doi.org/10.1070/RC1999v068n02ABEH000487>
4. Tretyakov, Yu.D. (1999). Solid state reactions. *Soros educational journal*, 4, 35-39.
5. Buchachenko, A.L. (2001). Magnetic Isotope Effect: Nuclear Spin Control of Chemical Reactions. *J. Phys. Chem. A*, 105 (44), 9995–10011.
DOI: 10.1021/jp011261d
6. Buchachenko, A.L. (2007). *New isotopes in chemistry and biochemistry*. Nauka, Moscow, 189 p.
7. Soboliev, V., Bilan, N. and Samovik, D. (2013). Magnetic stimulation of transformations in coal. *Annual Scientific-Technical Collection – Mining of Mineral Deposits 2013*, 221-225. DOI: 10.1201/b16354-41
8. Pivnyak, G.G., Sobolev, V.V. and Filippov, A.O. (2012). Phase transformations in bituminous coals under the influence of weak electric and magnetic fields. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 5, 43-49.
9. Soboliev, V.V., Bilan, N.V. and Khalimendik, A.V. (2017). On formation of electrically conductive phases under electrothermal activation of ferruginous carbonate. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 4, 53-60.

STUDYING REGULARITIES OF AIR MOVEMENT THROUGH A FILTERING HALF-MASK

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Purpose. Objective is to study the available approaches to calculate pressure difference of filtering respirators, to determine theoretical dependences of its change in terms of different filtering rate according to the breathing process with the use of filtering models of interconnected channels and parallel cylinders, and to generalize the results obtained in the context of mathematical models.