

software "ImageLab". The phase analysis and residual stresses measurements were performed on a Rigaku Ultima IV X-ray diffractometer.

Findings. The density of the samples after CIP is slightly higher than the density of the uniaxially pressed samples. The coercive force raised from 6,7 to 6,9 kA/m and average microhardness increased by 9.5% after the CIP at the 0.3 GPa. The distribution of grain size WC showed that the increased pressure of the preliminary CIP leads to a shift of the maximum toward smaller dimensions. The thickness distribution of Co interlayers has shown that the increased pressure of the preliminary CIP leads to a decreasing in the thickness of the interlayer. Analysis of the x-ray data showed the presence of WC (PDF Card 01-078-7532) and Co (PDF Card 01-071-4238) phases. According to the XRD measurements after sintering the surface of all samples is in a stress-strain state and the observed microhardness growth is obviously caused by this phenomenon. Thus, an experimental study showed that the preliminary CIP (under the 0.2 and 0.3 GPa) of WC-Co samples leads to an increasing of the coercive force, a decreasing (possibly due to crushing) of WC grain sizes and thinning of Co interlayers between these grains, which fully corresponds to the well-known regularity.

They contain the researches, which were conducted within the project № 0118U001035, financed by the NAS Ukraine.

Key words: CIP, WC-Co, coercive force, grain size, layers thickness, microhardness

IMPACT OF STRAY CURRENTS IN ELECTRICAL SYSTEMS OF UNDERGROUND TRANSPORT: AN OVERVIEW AND METHODS FOR SOLVING PROBLEMS

GOLOVCHENKO Anatoliy & BOLSHENKO Oleksandr
Dnipro University of Technology, Dnipro, Ukraine

The metro system in the modern world is widely used in the urban transport system. Nevertheless, many negative consequences, such as electrochemical corrosion on the metro route caused by a wandering current, endanger the metal structures and personal safety of both passengers and service personnel.

In article factors of wandering currents on the "Metro" system, their effect on the construction of reinforced concrete, metal structures, as well as on the rails and electrical equipment of the train are examined and analyzed.

In general, there are various methods for analyzing the distribution and impact of a stray current in the subway structure: a network model, a ground return model, a concentrated parameter model, an equivalent layer model, and a resistive type model.

Based on these models, the distribution of the underground electric field, its effect on the occurrence of stray currents, and possible ways of reducing the impact and magnitude of the current on the metal structure, which is possible with the use of renewable energy sources, in particular solar panels, is analyzed.

Based on the analysis, soil and humidity of the subway tunnel play an important role in reducing the negative impact of the wandering (parasitic) current, which in turn emphasizes the need for research in this direction and the creation of a mathematical model for a more detailed analysis of this problem.

Keywords: subway, stray currents, problem, solar panel

References

1. Pivnyak, G., Dychkovskiy, R., Smirnov, A., & Cherednichenko, Y. (2013). Some aspects on the software simulation implementation in thin coal seams mining. *Energy Efficiency Improvement of Geotechnical Systems*, 1-10. DOI: <https://doi.org/10.1201/b16355-2>
2. Pivnyak, G., Dychkovskiy, R., Bobyliov, O., Cabana, C.E., Smoliński, A. (2018). Mathematical and Geomechanical Model in Physical and Chemical Processes of Underground Coal Gasification. *Solid State Phenomena*, (277), 1-16. doi: <https://doi.org/10.4028/www.scientific.net/SSP.277.1>
3. Шкрабець Ф.П. The systems of backup power supply based on Renewable energy sources for mobile facilities / Ф.П. Шкрабець, П.Ю. Красовський, В.В. Бердник // Науковий вісник НГУ. - 2017. - № 2 - с. 81-86.
4. Машинно-трансформаторний агрегат для вітроенергетичних установок/ Панченко В.И., Цыпленков Д.В., Гребенюк А.Н., Кириченко М.С., Бобров А.В. // Електротехніка і електромеханіка: науково-практ.журнал. - Х.: НТУ «ХПІ», 2016. - №1. – С. 33-37. doi: 10.20998/2074-272X.2016.1.06
5. Альтернативна енергетика в Україні: монографія / Г.Г. Півняк, Ф.П. Шкрабець; Дніпропетровськ: Нац. гірн. ун-т. Д.: НГУ, 2013. –109 с.

INFLUENCE OF OVERHEATING AND COOLING RATE ON THE STRUCTURE AND PHYSICOCHEMICAL PROPERTIES OF AL-CU ALLOYS

FILONENKO Nataliia^{1,2}, BARTASHEVSKA Ludmila³ & IVANOV Nikita¹

¹State institution "Dnipropetrovsk Medical Academy of Ministry of Health of Ukraine"

²Iron and Steel Institute named after Z. I. Nekrasov of the National Academy of Sciences of Ukraine (ISI NASU)

³Dnipro University of Technology

Purpose. Study the was to investigate the structural properties of Al-Cu alloys depending on the heating temperature of the alloy above the liquidus, the cooling rate [1-3].