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., Dychkovskyi, 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., Dychkovskyi, 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 Ludmila[3] & IVANOV Nikita[1]
[1]State institution "Dnipropetrovsk Medical Academy of Ministry of Health of Ukraine"
[2]Iron and Steel Institute named after Z. I. Nekrasov of the National Academy of Sciences of Ukraine (ISI NASU)
[3]Dnipro 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].

Methodology. The investigations were carried out on Al-Cu alloy samples with copper content 25,0 -36,0% (mass.), the rest is aluminum. The melting of samples was carried out in a Taman furnace at temperatures of 820-1100 K with a graphite heater in alund crucibles. Cooling rate of alloys was 10 K/s. Part of the samples were made using the same method, but after heating poured into wedge shapes, at the expense of which when cooled in the wide part of the wedge the cooling rate was obtained 10^2 K/s, and in the thin part – 10^4 K/s. In the work we use differential thermal, metallographic, chemical and X-ray spectroscopic analyses.

Findings. The effect of overheating of the melt and cooling rate of alloys of the Al-Cu system with a copper content of 25.0-36.0% (mass.), the rest of the aluminum is investigated. It is shown that an overheating of the liquid at 50-100 K above the liquid-liquid line leads to the formation of a fine-dispersed eutectic structure and the inhibition of the formation of primary aluminum crystals in the pre-evacuation of alloys and the Al_2Cu phase in hypereuvtectic alloys, in accordance.

An increase in the melt overheating temperature by 150 K above the liquid-liquid line and the subsequent cooling at 10^3-10^4 K/s leads to the complete inhibition of the formation of primary crystals.

An overheating of the melt on 100-150 K alloys above the liquid line and subsequent cooling with a velocity of 10^3-10^4 K /s reduces the rate of corrosion by 30-45% and increases the numerical value in 1,3-1,45 times the relative wear resistance, and the brittleness of alloys decreases in 1,2-1,35 times in comparison with the samples after casting.

Keywords: melt, overheating of the alloy above the liquidus line, Al-Cu alloy, Al_2Cu phase, eutectic.

References

1. Murray J. L., (1985) The aluminium-copper system, Meta. International ls Reviews. 30, 211-235.

2. Plevachuk Y., Sklyarchuk V., Yakymovych A, Eckert S., Willers B., (2008) Eigenfeld Density, Viscosity, and Electrical Conductivity of Hypoeutectic Al-Cu Liquid Alloys, Metallurgical and Material stransactions. 39, 3040-3045.

3. Konstantinova N.Yu., Popel P.S., Yagodin D.A., (2009) Kinematicheskaya vyazkost zhyidkih splavov med-alyuminiy, TBT, 47, №3 pp. 354- 359.