The aim of the work was to optimize the process of germanium bioleaching from the dumps after coal beneficiation, namely, to determine the optimal composition of the new nutrient medium for acidophilic chemolithotrophic bacteria ensuring the maximum recovery of valuable metal in minimum time. We optimized the method of mathematical planning adapted to the plan in Greek-Latin squares. The calculations in this approach are based on the analysis of variance. The formal design of experiments has been carried out with four operating factors at four levels. The calculations were performed in Excel. The significance of the factor levels were analyzed using the Duncan’s multiple range test, the uniformity of the variances was examined the Cochran test, and the significance of the factors was tested by the Fisher criterion for each day of the experiment. The obtained results were interpreted mathematically and biologically. The following combination of factors and their levels was recommended as optimum nutrient medium, g/dm$^3$: \( \text{KH}_2\text{PO}_4 \) — 1.0; \( (\text{NH}_4)\text{SO}_4 \) — 2.0; \( \text{KCl} \) — 0.1; \( \text{MgSO}_4 \) — 0.5; \( \text{NH}_4\text{Cl} \) — 0.5; \( \text{Na}_2\text{S}_2\text{O}_3 \) — 5.0. The proposed composition allows the more than 90% quick extraction of germanium into the solution (in four days), which was previously impossible.

**Key words:** bioleaching, acidophilic chemolithotrophic bacteria, germanium, coal beneficiation, Greek-Latin squares, variance analysis.
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