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REVIEW

for dissertation work: "**DEVELOPMENT THE TECHNOLOGY FOR THE COMPLEX PROCESSING OF MAN-MADE TAILINGS OF THE ENRICHMENT OF DONSKOY GOK**" for the degree of Doctor of Philosophy (PhD) in specialty 6D070900 - "Metallurgy"

DYUSSENOVA SYMBAT BERIKKALIKYZY

The dissertation details research of novel scientific and societal significance. Accumulation of substantial amounts of anthropogenic mine tailings has occurred in many nations and presents significant environmental impacts. Towards reducing this problem, new technologies are needed for economically viable processing of tailings to recover useable commodities and reduce environmental impact. The current dissertations focuses on such technologies for the processing of chromium-bearing mine tailings. This is certainly a suitable topic for a PhD dissertation.

In the course of her doctoral studies, S.B. Dyussenova completed a scientific internship at the Center for Sustainable Energy at Notre Dame (ND-Energy), which is part of the University of Notre Dame. During the scientific internship, S.B. Dyussenova showed a high level of theoretical training, practical knowledge and competence in various areas of metallurgical activity. Having independently conducted physicochemical studies, she mastered the methods of working with a JSM-6490LA electron microscope from JEOL, and an Orbis X-ray fluorescence spectrometer from EDAX AMETEK.

In the course of her work on the dissertation, the stated scientific goal was achieved, which consists in developing a technology for the complex processing of man-made tailings for enrichment of DMPP, as well as in studying the mechanism

and transformation of the phase structure of tailings for enrichment of DMPP during chemical activation.

The technology for the integrated processing of chrome ore dressing tailings at DMPP has been developed, the novelty of which is the use of gravity dressing with preliminary chemical activation and of a regenerated acid reagent in hydrometallurgical processing. The results of the comprehensive processing of tailings obtained in the studies were adopted to calculate the Technological Regulations (TR) and the Preliminary Feasibility Study (FS) on the project topic: "Determining the concentration of rare and rare-earth metals in the processing of JSC TNK Kazchrome and developing a method for processing industrial products"

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The new method for the chemical activation of chrome ore dressing tailings before gravity dressing, by treatment with a sodium hydrogen carbonate solution, changed the phase structure of the sludge, which made it possible to increase the extraction of Cr_2O_3 into a concentrate and to obtain high-quality chromium concentrate.

According to the developed method, the synthesis of ammonium hydrosulfate is carried out in an autoclave at a temperature of 230 - 260 °C in a mixture of ammonium sulfate and sulfuric acid and, thereby, the use of expensive ammonium hydrogen sulfate for leaching is excluded.

The method has been developed to produce high-quality amorphous silicon dioxide, the difference of which is the use of sodium bicarbonate solution to neutralize the silicate solution to a pH of 9.0–9.5.

S.B. Dyusenova's dissertation is a complete independent research work containing new specific technical solutions to an important task aimed at expanding the fundamental base and developing experimental material for building a highly efficient technology for their processing.

The dissertation submitted for defense suggests that S.B. Dyusenova has a high level of scientific preparation, has sufficient knowledge of scientific analysis methods and deserves the award of a Doctor of Philosophy (PhD) degree in specialty 6D070900 - Metallurgy.

Scientific adviser of dissertation work
PhD, Professor of Civil and Environmental Engineering and Earth Sciences
Professor of Chemistry and Biochemistry
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