New Directions for Tailings Management

Priscilla P. Nelson, Colorado School of Mines, USA

Abstract

The global mining industry anticipates annual production rates increasing inexorably during the coming decade, and the world-wide concern for the potential consequences from conventional tailings dam failure. This paper will provide an update on new technologies and approaches to safer tailings management that are being pursued since the 2021 writing of the Chapter on the "Future of Tailings Management" included in the SME Tailings Management Handbook. The paper will present approaches to "zero waste" mining, including in situ mining to reduce tailings volume, advanced processing that reduces water requirements and minimizes reagents, upscale and downscale uses for tailings materials, mine waste remining for critical minerals and metals, and new materials manufactured from tailings. Zero waste operations will extend the value chain for the mining industry to engage the circular economy through downstream production of value-added products that minimize the need for tailings disposal. This presentation reviews the variety of opportunities for tailings management such that the long-term impacts and liability are reduced, and for revenue generation through remining/reprocessing when extraction technology improves. The paper will also include discussion of opportunities for innovations in tailings dewatering including the potential for mass application of in situ electrokinetics for existing conventional TSFs. In addition, the paper will include discussions on new approaches to mine closure, reclamation, and repurposing of sites at the end of life of mine.

Brief Biography of the Author

Priscilla P. Nelson is a Professor at the Colorado School of Mines. She has an international reputation in geological and geotechnical engineering and has been involved in the mining and underground construction industries for over 45 years. She previously worked at the U.S. National Science Foundation, the University of Texas at Austin, and the New Jersey Institute of Technology. Priscilla is a Distinguished Member of the American Society of Civil Engineers (ASCE), former president of the Geo-Institute of ASCE, a lifetime member and first president and Fellow of the American Rock Mechanics Association, a Mole, and has received numerous other distinctions and awards. In 2020, she founded the Tailings Center, and industry/university research and education collaboration with involving Mines, the University of Arizona, and Colorado State University.