

Editorial for Special Issue “Gravity Concentration”

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Gravity concentration is the process by which particles of different densities, sizes, and shapes separate from each other when under the action of gravity or centrifugal forces. Since handpicking was no longer enough to recover concentrate ores, mineral processing has relied on gravity concentration processes to selectively separate minerals on an industrial scale. Gravity concentration remains the principal concentration method used in mineral processing in terms of tons processed and has aroused a renewed interest by industry due to its relative simplicity and low environmental impact compared with flotation. Not by chance, the extensive research carried out in the last years allowed the beneficiation of increasingly fine minerals (up to 10 μm) through the so-called centrifugal or gravity-enhanced concentrators. More and more studies have also addressed using dry gravity concentration methods, whose environmental appeal should grow in the coming years. The current scenario also points toward a growing of data-based modeling and machine learning applications oriented to increase the productivity of gravity concentration operations. The contributions of this special volume demonstrate that milestones achieved in these topics by recent investigations are paving the way for the next breakthrough in gravity concentration.

The paper by Zhang et al. [1] clearly exposes how CFD-based models are being used for obtaining valuable insights into particle classification in centrifugal devices such as hydrocyclones as the possibility to concentrate particles of up to 8 μm . The recovery of ultrafine minerals is also investigated by Xiong et al. [2], who tested the use of a large-scale centrifugal separator to concentrate tungsten and tin ores. These two articles embody the growing trend of pushing the limits of density-based separators to process increasingly finer particles, stepping into size ranges traditionally dominated by flotation. Other studies in the present volume show how classical gravity concentration techniques and procedures can be adapted or upgraded to meet new demands. Ivan Silin et al. [3] designed a small-scale processing plant having spirals, hydrocyclones, and shaking tables to successfully concentrate vanadium in lead vanadate ores, a more and more critical element for green energy technologies. Callan Lowes et al. [4] present an innovative method for determining the washability and partition curves by using a solution of tungstate salts in a REFLUX classifier, thus avoiding the issues associated with organic liquids handling. The paper by Sampaio et al. [5] addresses the use of dry processing for pre-concentration of coals, a critical topic to the mineral processing industry given that water handling and usage faces increasingly severe environmental constraints.

Two review articles complete this volume. The paper by Veiga and Gunson [6] reviews gravity concentration methods used by artisanal miners based on trips to more than 35 developing countries, highlighting how these methods represent a greener option in comparison to amalgamation. The paper by Ambrós [7] provides an extensive and updated review of the several features of the jigging technique, one of the most iconic gravity concentration methods, also pointing out future possibilities of theoretical and technological developments to be explored soon.



Citation: Sampaio, C.H.; Ambrós, W.M. Editorial for Special Issue “Gravity Concentration”. *Minerals* **2021**, *11*, 1355. <https://doi.org/10.3390/min11121355>

Received: 22 November 2021

Accepted: 28 November 2021

Published: 30 November 2021

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All these works show that despite gravity concentration being an ancient practice, there is still a broad open field for innovation and breaking down the barriers associated with current issues in the mineral industry, such as dry processing, ultrafine beneficiation, and advanced modeling. Therefore, we are confident that this special issue is a relevant and helpful resource for all those interested in the areas of mineral processing and gravity concentration and that it will form the basis of future studies on the topic.

Conflicts of Interest: The authors declare no conflict of interest.

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