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Editorial

Editorial for Special Issue "Hydrodynamics and Gas Dispersion in Flotation"

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Gas dispersion, the breakage of a mass of gas into a population of small bubbles, is one of the most important subprocesses occurring in flotation machines. The technology establishes hydrodynamic conditions for the selective separation of particles via the formation and removal of bubble–particle aggregates. Flotation machines are designed and operated to provide a collection zone for the formation of bubble–particle aggregates, and a froth zone for the separation and concentration of these aggregates into a concentrate stream. Operators manipulate gas flow rate, pulp density, and frother concentration to maximize the available area of the bubble population. In addition, the froth depth and frother type are also defined to control the breakage rate of bubble–particle aggregates, as they rise to overflow into the concentrate launder. The variables used to characterize gas dispersion are the bubble size distribution (represented as an average diameter), gas holdup, superficial gas rate, and water carried by bubbles from the collection into the froth zone.

The eleven papers submitted to this Special Issue show the current interest of different research groups in improving metallurgical performance based on characterizing and better understanding machine hydrodynamics. There are four contributions on the development of online sensors, simulators, and models to define the machine designs and operating strategies: (i) a correlation between froth water content and water overflow rate [1], (ii) a correlation between gas holdup and flotation performance, which demonstrated that the former captured the combined effect of gas rate and frother concentration [2], (iii) a demonstration of a model reliability to predict bubble size from gas velocity and holdup measurements [3], and (iv) a simulation tool that incorporated gas dispersion, which proved the potential of changing the launder designs to improve flotation performances [4]. Bubble size measurement was another area with three contributions: the effect on interfacial area by considering stereological corrections in the bubble size estimation from 2D images [5], the increase in the automatically identified bubbles by modifying the sampling devices to reduce the presence of clusters [6], and the detection of abnormal hydrodynamic conditions (presence of cap-shaped bubbles) in industrial flotation machines [7]. An option for increasing the formation of bubble–particle aggregates is the use of micro and nanobubbles: a review on the generation, detection, and applications of nanobubbles in flotation was included in this volume [8], along with a study on the potential of bulk micro-nano-bubbles to improve quartz recovery [9]. The use of pulps containing soluble ions and frother molecules at the same time has been common in current flotation practice: (i) the arrangement of adsorbed frother molecules on the bubble surface proved to be influenced by the presence of different ions in the pulp [10], and (ii) electrolytes proved to reduce bubble coalescence, favoring the formation of small bubbles; however, in some conditions, they also promoted the formation by breakup, resulting in larger bubbles [11].

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