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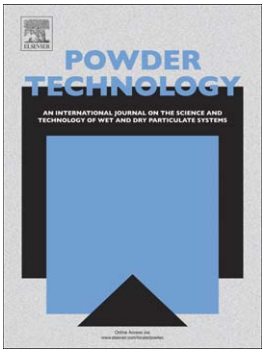

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Determination of the volumetric solids fraction of saturated polydisperse ore tailing sediments

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ABSTRACT

The objective of this work is to determine the concentration profile of a saturated polydisperse ore tailing sediment without the presence of flocculant and in steady state. To this end, a method to resolve the balance of effective solid stress $\sigma(z)$ and concentration profile $\phi(z)$ is developed. This method considers a stress distribution in a saturated and static granular medium in equilibrium with the hydrostatic pressure of the surrounding fluid. To resolve the coupled problem $(\sigma(z),\phi(z))$, a new constitutive equation for the volumetric solids fraction is proposed based on the concept of the compressibility of porous material. As a result, a method to estimate the axial concentration and effective stress distribution profile as a function of quantifiable physical parameters is obtained. The solution is validated using a series of laboratory experiments consisting of batch sedimentation tests of suspensions at different concentrations and carried out in graduated cylinders. In this work, the experimental results and simulations for three different types of material are presented: a) tailings with high coarse particle content, b) typical tailings and c) copper ore concentrate. It is concluded that the developed model allows the

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