Dewatering behaviour of filtered red mud

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# ABSTRACT

The high-water content of red mud in tailing storage facility (TSF), combined with its composition, presents challenges such as reduced structural stability, environmental risks from toxic seepage, and the necessity of larger disposable land. Filtration is a widely employed dewatering method that can increase the solid content of red mud to 50–75%, depending on the technique used, thereby improving TSF storage capacity and structural stability while reducing seepage risks. However, once deposited, red mud continues to undergo settling, consolidation, and desiccation, often achieving a dry density beyond what filtration alone can accomplish. Moreover, climatic factors such as frequent rainfall and limited solar exposure can lead to rewetting and reduced evaporation, potentially diminishing the long-term effectiveness of filtration. Therefore, understanding the impact of natural weather on the dewatering and densification of filtered red mud is essential.

To investigate this, a comprehensive study was conducted, integrating characterisation tests on both filtered and unfiltered red mud, followed by basin tests to examine their desiccation behaviour. An outdoor instrumented column experiment was performed, where two columns, each equipped with moisture and suction sensors, were filled with filtered and unfiltered red mud and subjected to natural drying. Finally, consolidation tests were conducted on both samples to assess their behaviour after disposal in the storage facility. This study presents a long-term comparative analysis of dewatering and densification behaviour of filtered and unfiltered red mud under natural environmental conditions to further understand the effectiveness of filtration on red mud.