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Degradation of cemented MTs under a wide range of water acidities

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Mine tailings (MTs) are one of the greatest challenges for waste management in the mining industry. Mine galleries backfilling using pastes (typically MTs+Ordinary Portland Cement (OPC)+water) has been stablished as one of the most economic, safe and socio-environmentally accepted waste disposal method. The present study use a MTs from a massive sulfide stockwork mixed with **OPC** or with a $MgCO_3$-MgO-rich by-product from the manufacture of **$Mg(OH)_2$** (PC-8) at 4wt% and 15wt%, respectively. Prismatic specimens **(4×4×16 cm³)** were prepared and submitted to a six months flow-through experiment using waters with four very different acidities (0, 500, 1000 and 1500 mg/L as $CaCO_3$ approx.). Physicochemical parameters and water samples were obtained weekly. Two Prismatic specimens are removed from the flow-through experiment every 2 months and analyzed to know their Uniaxial Compressive Strength (UCS). The main objective of this study is to comparatively evaluate the effect of Portland cement versus an alternative alkaline reagent on the chemical and physical stability of these pastes under a wide range of water acidities.

The following results corresponds to 3 months of water monitoring and one UCS test after 2 months of prismatic specimens degradations. 6 months of water monitoring and UCS tests at 4 and 6 months will be presented in the Conference. At the beginning of the experiment, the specimens raised water pH values in all cases. This increase is more noticeable in waters with higher initial pHs (Tap and AMD1). After 3 months, the system tends to stabilize, with water's pH approaching their initial values, with the clear exception of OPC-AMD1 and PC8-AMD1 that remain higher than AMD1. AMDS neutralization induced a precipitation of metals and the concomitant reduction of the waters electric conductivity. Additionally, the experiments with higher acidity waters (AMD3 and AMD2) a significant formation of iron precipitates was observed in the surface of the prismatic specimens. UCS data obtained after 2 months of experiment suggest a progressive degradation of the OPC paste when exposed to AMDs with higher acidities. This trend can bot be observed for PC8 paste specimens, that show very similar results disregarding the the acidity of the AMDs.