

Utilization of mine tailings as partial cement replacement - DTU Orbit (09/11/2017)

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Depositing mine tailings entail major economic costs and negative environmental impacts. Thus finding an alternative to depositing is of interest. This study focused on the use of mine tailings as partial cement replacement, thereby preventing depositing the mine tailings. At the same time, such use would reduce the CO₂ emission related to the production of cement. Mine tailings from two different mines Zinkgruvan (Sweden) and Naluñaq (Greenland) were both tested as 5 and 10 % cement replacement. All mortar specimens with mine tailings had lower compressive strength compared to a reference specimen at 7, 14 and 28 days of curing. Both mine tailings showed contributions to the pozzolanic activity. This tendency was more profound for Zinkgruvan. No evidence of either mine tailing containing minerals acting as nucleation sites was, however, seen. The specimens containing mine tailings were compared to a specimen containing a 10 % replacement of cement with coal fly ash, commonly used in Denmark. The compressive strength of specimens containing mine tailings exceeded the compressive strength of the specimen containing coal fly ash, indicating further the amorphous content of volcanic decent contained in the mine tailings to contribute to the pozzolanic activity and thus increase the compressive strength. Mine tailings have a high content of toxic chemical elements, but no significant amount of chemical elements was seen leaching from neither the pure mine tailings nor the mortar specimens containing mine tailings. Overall, the results show that these mine tailings have potential as a mineral admixture for substitution of cement in concrete.

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