**Supplementary materials**

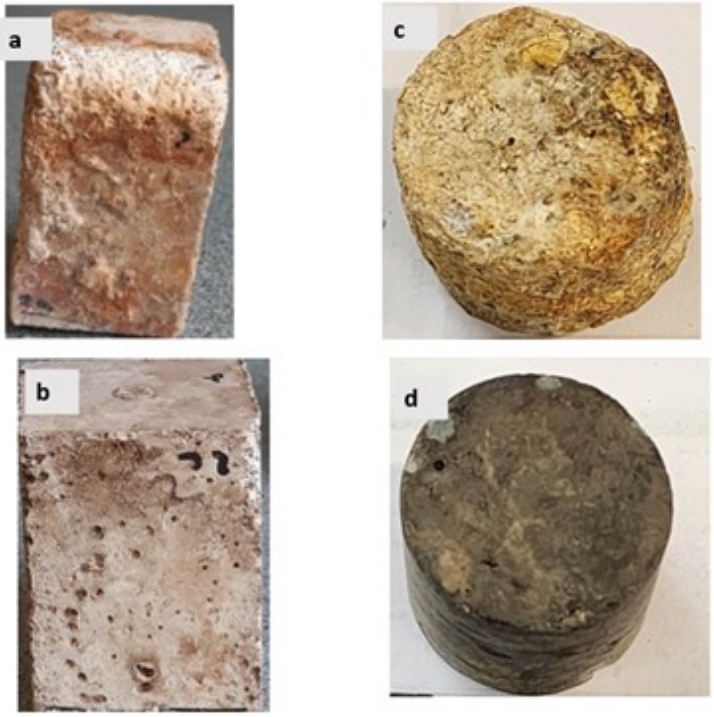


**Figure 1**. Physical deterioration of cement specimens (**a**-cement mortar from sewage pumping location, **b**- cement mortar from sand-trap site, **c**-cement paste from sewage pumping location, **d**-cement paste from sand-trap (This is cited from Nedson *et al* 2024).

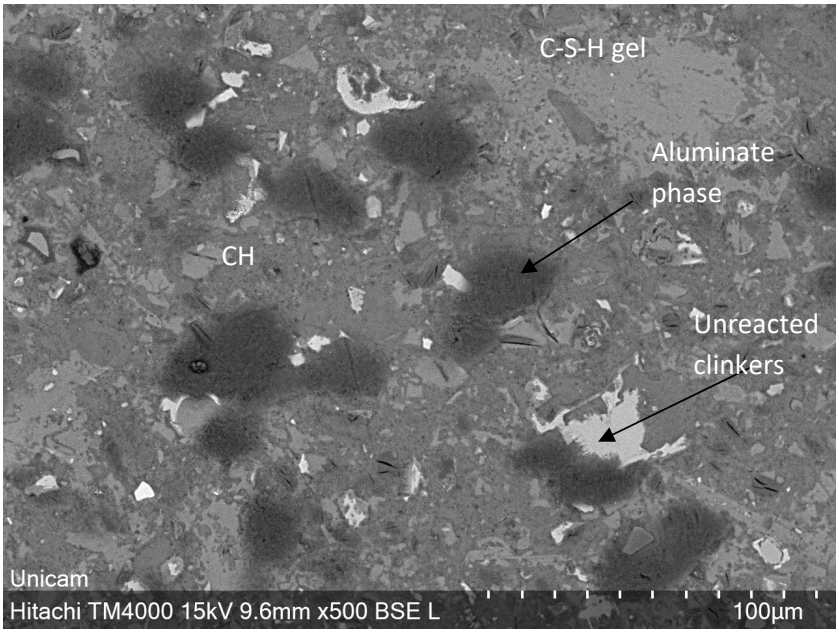


**Figure 2**: SEM-BSE **images** showing the Microstructure of OPC cement paste. The where white parts are unreacted clikers , **C-S-H** (calcium silicate hydrate) and **CH**-Portrandite).

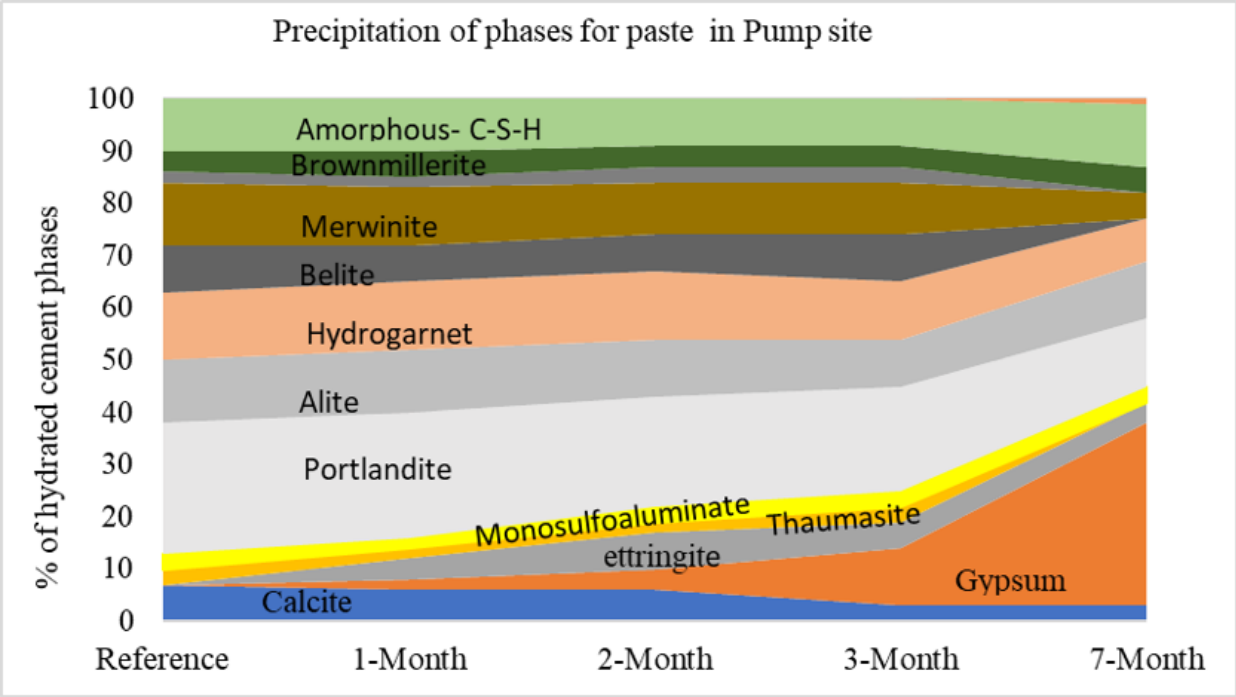


**Figure 3. Mineral phases assemblage of the OPC cement exposed to the pumping station. After 7-months of exposure, the mineralogical assemblage showed the evolution and increase of sulfur-bearing phases, ettringite and thaumasite. Higher amount of these minerals implies lower strength of material and hence deterioration.**

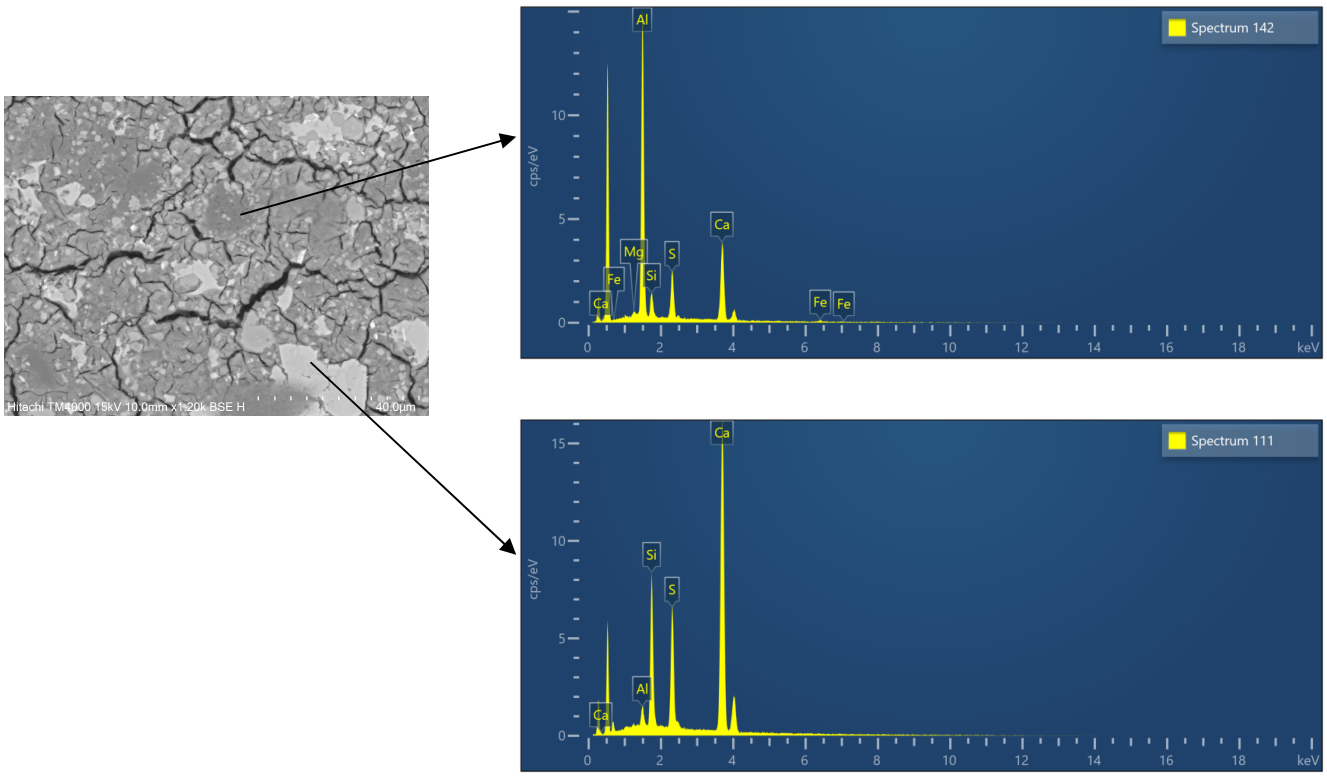


**Figure 4**: Microstructure of Calcium sulfoaluminate cement hydrated paste and its elemental changes of the microstructure. The grey phase had higher aluminium indicating the presence of Al-bearing phases such as ye'elimite, ettringite and gibbsite whereas the white phase dominated by ca-bearing minerals which were determined by XRD as calcite, and gypsum among others.