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# Dissolution Studies of Glass Wool and Stone Wool at Alkaline pH †

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**Abstract:** Mineral wools—a general term for stone wool and glass wool—are the most common insulation materials in the world. Consequently, 2.5 million tons of mineral wool waste is generated globally which is mainly landfilled. Recently, it was found that mineral wool waste can be used as cementitious material by alkali activation. In alkali activation, dissolution is the primary process as it involves the breakage of bonds and release of ionic species from the surface of the material upon interaction with the reacting solution. Dissolution plays a significant role in the strength development and micro/nano-structural morphology of the final cementitious material. Here, we study the dissolution of stone wool (depicting chemistry of Al-Ca-Mg-Fe silicate glass) and glass wool (depicting chemistry of soda lime silicate glass) in sodium hydroxide solution to provide a better understanding of their reactivity under alkali activation.

Experimental studies were carried out at two different liquid to solid ratio (L/S) conditions: high L/S (1000) and low L/S (50) in an $N_2$ glove box. High L/S conditions give information on the early stages of the dissolution whereas low L/S provides later stages of the process.

The ICP results show that under both L/S conditions glass wool releases increasing amount of Si, Al and B reaching 39–45 wt.%, 23–26 wt.% and 34–44 wt.% extent of dissolution with time respectively. However, in stone wool the release rate of Si and Al increases initially but becomes constant after certain time period. In both mineral wools, release rate of Ca and Mg varied with time. These changes in the release rate was observed to be due to precipitation of dissolved species. XRD results revealed that three crystalline phases-hydrotalcite, calcite, and calcium silicate were present on both glass and stone wool fibers after 25 days of dissolution. SEM results revealed that the morphology varies at different dissolution times and experimental conditions for both the mineral wools depicting the change in the reaction path. From these studies, we conclude that the dissolution rate and mechanism are controlled by both chemical composition of the fiber and the reacting solution conditions.

**Keywords:** dissolution; mineral wool; alkali activation; glass composition; solution chemistry