A study on the characterization of the HFNP by using mineral carbonization method

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The amount of construction waste produced in Korea increases yearly due to the significant number of aged buildings requiring re-construction. Shortages in raw materials and available landfill sites, means an improvement in construction waste recycling is required. In the intermediate-construction waste recycling process, crushing and screening produces a large amount of concrete sludge composed of fine-grained concrete material. Water is used to wash down the concrete surface and separate impurities. The concrete sludge is strongly alkaline and rich in Ca as a result of calcium hydroxide ($Ca(OH)_2$) dissolution from the concrete particles (Tsunashima *et al.*, 2012). Furthermore, the dried fine grained solid waste (FGSW) are discarded at a rate of 10 tons day^{-1} as they were considered to have insignificant economic value. In our previous study, the feasibility of a carbon mineralization process for the neutralization of Ca-rich alkaline wastewater was successfully demonstrated from both environmental and economic perspectives (Yoo *et al.*, 2017). In this study, therefore, the mineral carbonization process using fine particle dispersed wastewater (FPDW) was conducted to consider both FGSW recycling and alkaline wastewater neutralizing. The main purpose of this study is to produce a high functional nano particles (HFNP) which is $CaCO_3$ coated onto FGSW surface using the mineral carbonization process and to evaluate applicability of that via comparing characterization with pure $CaCO_3$. A schematic experimental flow diagram is provided in Figure 1.

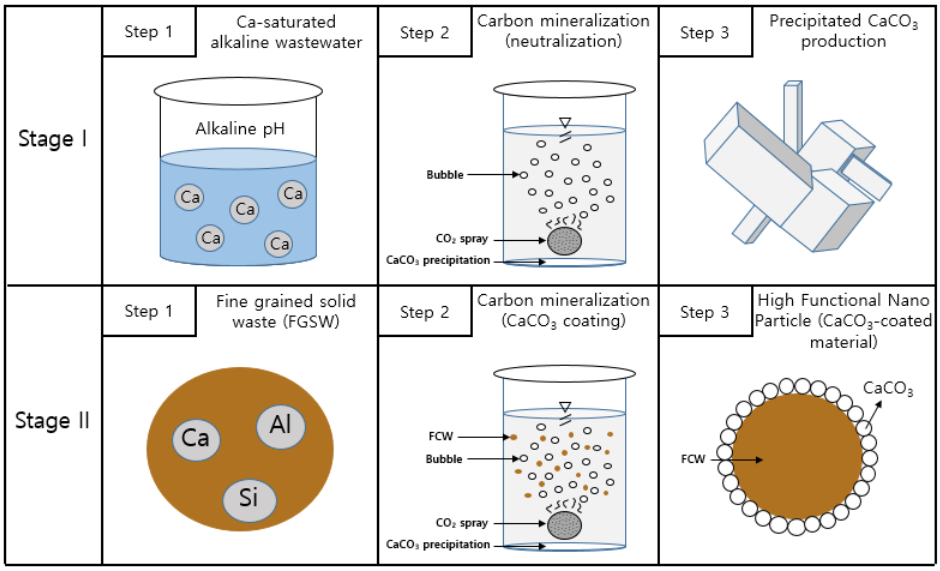

Figure 1. A schematic experimental flow for producing HFNP through mineral carbonization process

The mineral carbonization process using FPDW at a pulp density of 0.01 (w/v) showed that $CaCO_3$ was completely coated onto the FGSW surface, which is confirmed by the morphological changes of solid surface (Figure 2). Silica and alumina composing the FGSW were removed by $CaCO_3$ precipitation onto the surface through mineral carbonization process.

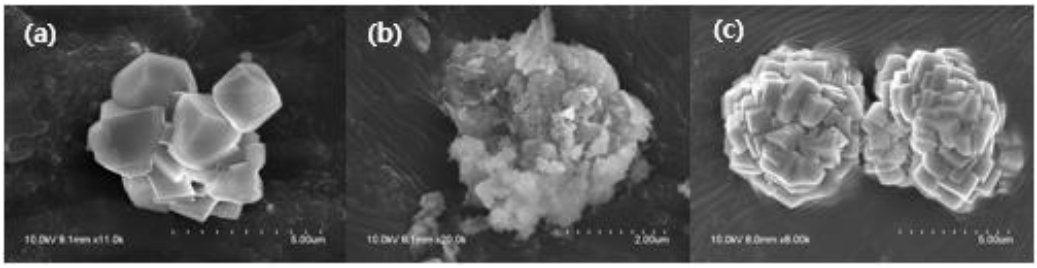

Figure 2. The SEM images of (a) pure precipitated $CaCO_3$, (b) FGSW, and (c) $CaCO_3$-coated particles (HFNP)

Reference

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