

Mineralogical characteristics and Chemical Dissolution of Chrysotile Asbestos in Soils

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A number of asbestos miners in S. Korea were extensively exploited for chrysotile asbestos in the early of the 20th century and no remediation of soils around the abandoned mines has been done. The objective of this study was to investigate mineralogical characteristics of asbestos-containing soils and remediation of asbestos-contaminated soils.

Soils from abandoned asbestos mines in Hongseong and Gapyeong, S. Korea were sampled, fractionated by sedimentation method. Chemical dissolution using four types of chemicals (hydrochloric acid, sulfuric acid, oxalic acid, hydrogen peroxide) was conducted to remediate the chrysotile asbestos-containing soils. Mineralogical and chemical characterization were performed by XRD, PLM, SEM-EDS, TEM-EDS, and ICP analyses.

Soil textures of the Gapyeong and Hongseong soils were sand and loamy sand, respectively. XRD, PLM and SEM-EDS analyses showed that fibrous chrysotile was observed in both soils and needle-shaped tremolite was observed in Gapyeong soils. TG-DTA and XRD analyses showed that chrysotile and tremolite in soils were transformed to forsterite and diopside with the temperatures about 810 °C and 1060 °C, respectively. Chemical treatment of the chrysotile showed release of Mg occurred and transformed into unknown minerals. ICP analysis implied that hydrochloric acid (HCl) and sulfuric acid (H₂SO₄) could be more effective for release of Mg and transformation of chrysotile. These results indicated that chemical dissolution using HCl and H₂SO₄ and heat treatment have the potential for remediation of chrysotile asbestos containing soils