

Characterization of Hydroxy-interlayered Mineral in Non-Andic Soils from Jeju Island

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Abstract

Jeju island is composed mainly of volcanic rocks such as basalts, trachytic andesites, tracytes, and sedimentary rocks. About 80% of Jeju soils are classified as Andisols. The amount of annual precipitation in Jeju island is about 1872mm, which is 1.5 times the annual precipitation of south Korea. There is a significant difference in amount of precipitation with regions even within Jeju island. In study area, the annual amount of rainfall is about 1280mm, the lowest in Jeju island while south part of the island has the annual precipitation of 2056mm, though they are only tens of kilometers apart. The parent materials of soils in study area are pyroclastic rocks and tuffs. The soils of non-andic properties have developed in this area since pedogenic process of pyroclastic materials is strongly influenced by climatic factor, especially precipitation. In order to investigate the mineralogical characteristics of soils, X-ray analysis for <0.2 and $2-0.2\mu\text{m}$ size fractions was performed with ethylene glycol solvation, K-, Mg-saturation, heat treatment(110, 330, 550°C). Acid-oxalate and DCB(sodium hydrosulfite, sodium citrate, sodium bicarbonate) dissolution method was used to assess the total amounts of Al, Si, and hydroxy interlayer of 2:1 layer silicates. XRD was also applied for samples treated with DCB only and DCB-oxalate sequentially.

XRD patterns showed that 2:1 and 1:1 layer silicates were found, which are different from soils of Andisols. Vermiculite, chlorite, hydroxy interlayered minerals, and interstratified minerals(vermiculite/chlorite) were observed in $2-0.2\mu\text{m}$ size fractions. After DCB treatments, ethylene glycolated samples with Mg-saturation showed expanded d-spacing, suggesting the possibility of hydroxy interlayered minerals. The amounts of hydroxy interlayered minerals increased in surface soil. Unlike Andisols, short range ordered minerals such as allophane, imogolite and gibbsite were hardly found. Mica and kaolinite existed in small amounts. Results are summarized in Fig. 1 and Fig. 2.

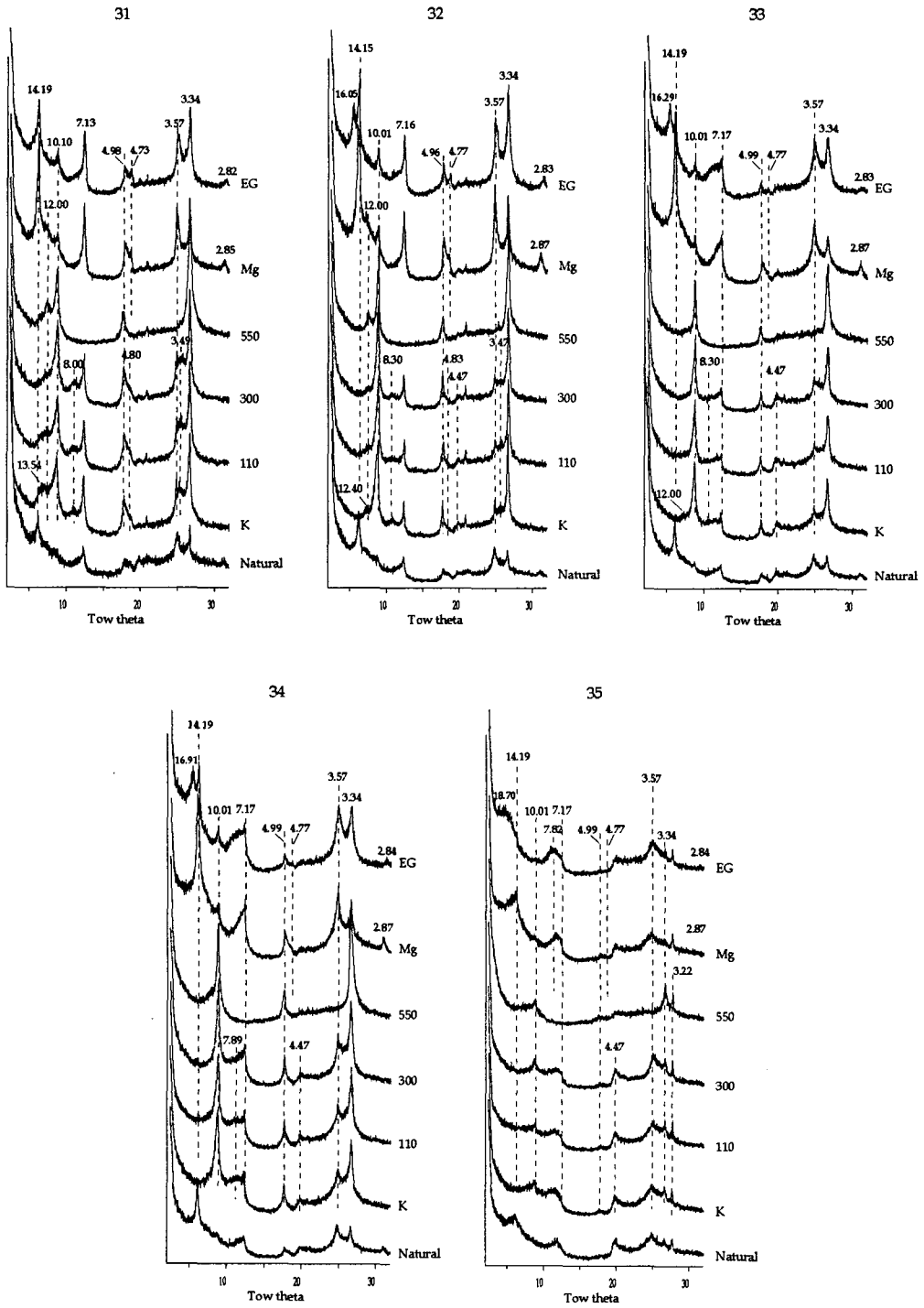


Fig. 1. X-ray diffraction patterns of DCB treated samples

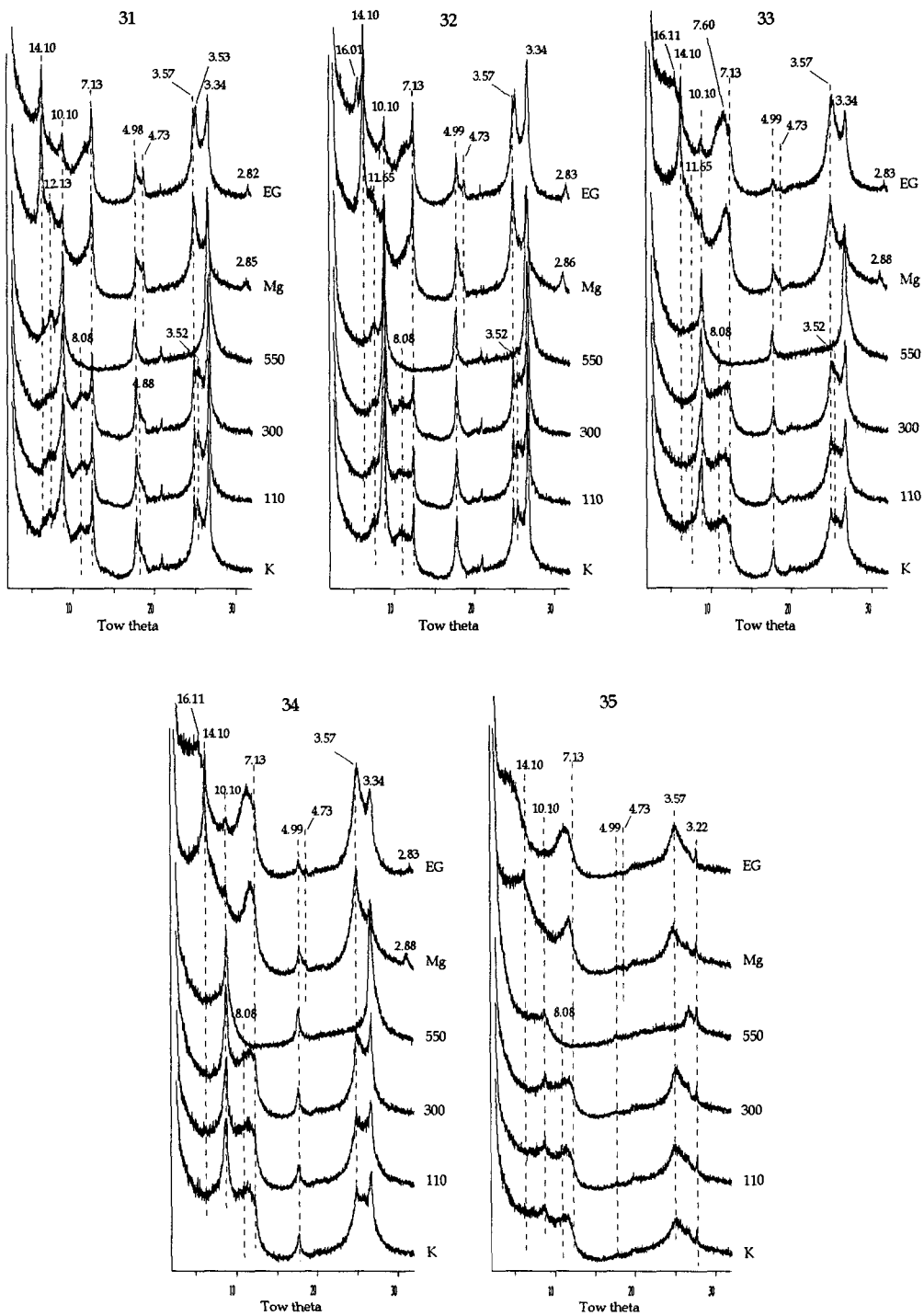


Fig. 2. X-ray diffraction patterns of DCB-oxalate treated samples