

Mineralogy of Some Andisols in Cheju Island, Korea, with Special Reference to Short-range Ordered Materials

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Andisols, recently established as an order in soil taxonomy (Soil survey staffs, 1990), are extensive in Cheju Island, Korea. We have investigated some representative Andisols mineralogically and chemically. Selective dissolution, X-ray diffraction, FT-IR, and TEM methods were employed to determine the mineralogy of two soil profiles. Top soil horizon with a cumulative thickness of 30-60 cm is characterized by its black color, high porosity (60%), high total C content (18.8 wt.%), and high organic bound Al content (90-150 cmole/kg). Soil pH (in H₂O) ranges from 5 to 6 with the increase of depth. Selective dissolution results show that the short-range ordered minerals (up to 40 wt.%) with Al(o)-Al(p)/Si(o) molar ratio of 1.5 to 2, and ferrihydrite (up to 20 wt.%) are predominated in the B horizon soils, especially in the <0.5 micron fraction. Gibbsite and imogolite are also dominant phases in the B horizon. XRD patterns for bulk and different size fractions indicate the presence of substantial amounts of kaolinite, chlorite, vermiculite with hydroxy interlayer, and illite with small amounts of some Fe-oxides in the whole profile soils. Imogolite is easily identified by the TEM observations of peculiar, thread-like morphology, and is confirmed by the FT-IR spectra after chemical and heat treatments. Andisols in Cheju Island are distinctive by the coexistence of allophanic materials, gibbsite, and imogolite in the B horizon, which were probably formed by the cumulation of the released active Al from the A horizon.