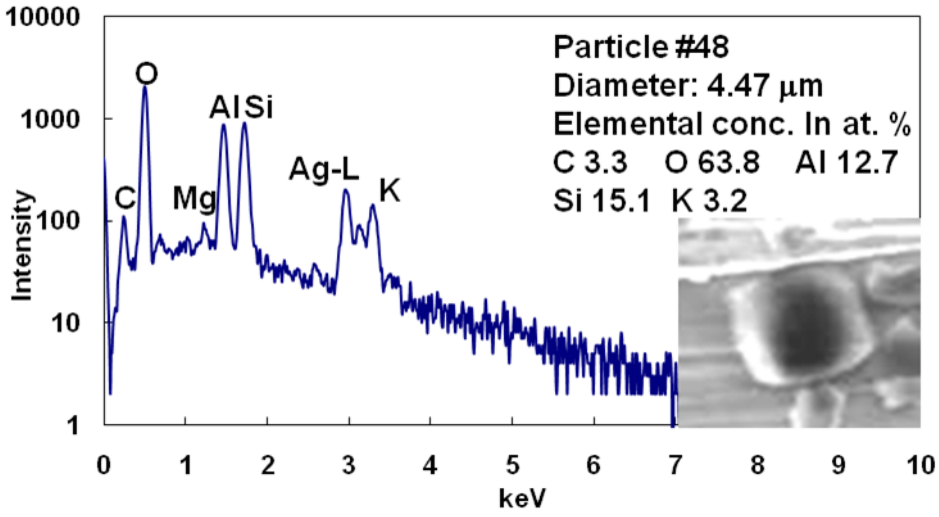
Single particle mineralogy of aeolian dust in the East Rongbuk ice core from Mt. Qomolangma (Everest)

Heejin Hwang, Hae-Jin Jung[1], Hyo-Jin Eom[1], M. A. Malek[1], Soon Do Hur, Chul-Un Ro[1]

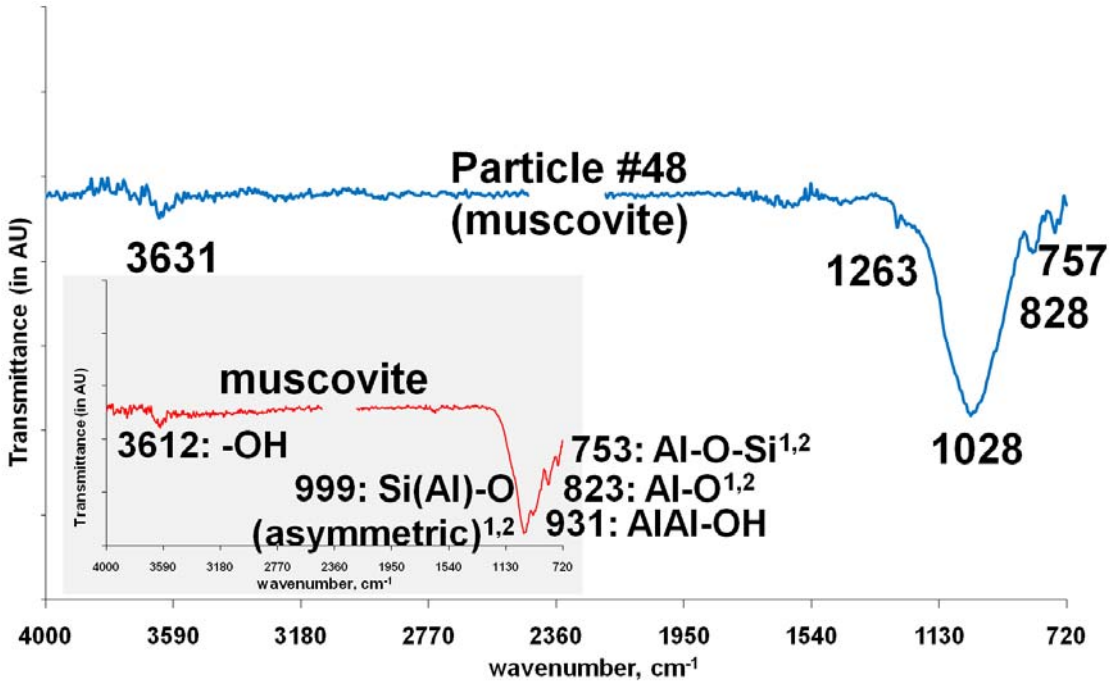
Korea Polar Research Institute, Get-pearl Tower, 12 Gaetbeol-ro, Yeonsu-gu, Incheon, 406-840, Korea
[1]Department of Chemistry, Inha University, 253 Yonghyun-dong, Nam-gu, Incheon, 402-751, Korea

ABSTRACT

A recent work demonstrated the practical applicability of the combined use of two techniques, attenuated total reflectance FT-IR (ATR-FT-IR) imaging and a quantitative energy-dispersive electron probe X-ray microanalysis, low-Z particle EPMA, for the characterization of individual aerosol particles. These single particle analytical techniques provide complementary information on the physicochemical characteristics of the same individual particles, such as low-Z particle EPMA on morphology and elemental concentrations and the ATR-FT-IR imaging on molecular species, crystal structures, functional groups, and physical states. In this work, this analytical methodology was applied to characterize an insoluble mineral particle sample in the East Rongbuk ice core from Mt. Qomolangma (Everest). On the basis of morphological, X-ray spectral, and ATR-FT-IR spectral data, 140 individual particles were classified into different mineral types, such as montmorillonite, montmorillonite + K-feldspar, K-feldspar, Na-feldspar, illite, muscovite, vermiculite, SiO_2, FeO_x, and $AlSiO_3$. In Figure 1, typical X-ray spectrum and ATR-FT-IR spectrum of a particle selected from the ice core sample are shown. This work demonstrates that more detailed physiochemical properties of individual airborne particles can be obtained using this approach than when either the low–Z particle EPMA or ATR–FT–IR imaging technique is used alone.



(a)



(b)

Figure 1. Typical (a) X-ray spectrum and (b) ATR-FT-IR spectrum of a particle #48 of an ice core sample containing major mineral as muscovite