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# Mid- and far-infrared spectroscopy for Li-Al-Mg micas

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Mica is a one of the major rock forming minerals and widely spread in the earth crust. The hydrothermal synthetic Li-Al-Mg trioctahedral mica series were measured by mid- and far-infrared spectroscopy and X-ray powder diffraction Rietveld refinement: (a)Trilithionite: $K(Li_{1.5}Al_{1.5})$ $(AlSi_3)O_{10}F_2$- Phlogopite: $KMg_3(AlSi_3)O_{10}F_2$, (b)Polylithionite: $K(Li_2Al)Si_4O_{10}F_2$- Tainiolite: $K(LiMg_2)Si_4O_{10}F_2$, (c)Polylithionite- Eastonite: $K(Mg_2Al)(Al_2Si_2)O_{10}F_2$ and OD- F Mg- Masutomilite: $K(LiAlMg)AlSi_3O_{10}(F, OD)_2$ .

The Li-Al-Mg micas synthesized hydrothermally at 600- 650 $^o$C and 150- 200MPa in cold-seal externally heated Tuttle-type vessels. The starting materials were mixed and then sealed in Pt/Au capsules with 20 wt % $D_2O$ (99.9 % in purity). X-ray Rietveld analysis was done using Rietan- 2000 (Izumi and Ikeda 2000). Mid- and far-infrared spectra were measured with JASCO FTIR- 620 spectrometer. Each sample was scanned 256 times in an evacuated sample-chamber.

All samples could refine monoclinic, C2/m (1M polytype). In the 250- 50cm$^{-1}$ far-infrared region , three kinds of bands are observed: these bands due to an in- plane tetrahedral torsional band between 170- 150cm$^{-1}$, an interlayer K- $O_{inner}$ stretching band between 120- 140 cm$^{-1}$ and K- $O_{outer}$ stretching band between 90- 100 cm$^{-1}$. With increasing<K- $O_{inner}$>, K- $O_{inner}$ stretching band shifts higher frequency, while with increasing <K- $O_{outer}$>, K- $O_{outer}$ stretching band shifts lower frequency. In the 650- 250cm$^{-1}$ mid- and far-infrared region, two parts of bands are observed. With increasing $^{[4]}$Si→Al, (Si,Al)- O deformational band in the range of 600- 400cm$^{-1}$ became broad and merged.

Keywords: Li-Al-Mg mica, hydrothermal synthesis, mid-infrared, far-infrared, Rietveld analysis