

Assignment of infrared OH-stretching bands in manganooan magnesio-arfvedsonite and richterite through heat-treatment

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ABSTRACT

Infrared OH-stretching bands in some heat-treated A-site occupied and ^{IV}Al-free (or nearly free) manganooan sodic-calcic and sodic amphiboles, manganooan magnesio-arfvedsonites and richterites, have been assigned. Two OH-stretching bands, (MgMgMg)-OH-A-O²⁻/F⁻/Cl⁻ and (MgMgMg)-OH-□ (□ = vacancy) configurations, persist to high temperature. With increasing temperature, the OH-stretching band, A*, of the (MgMgMg)-OH-A-OH (A = A site cation) configuration shifts downward from 3730 to near 3700 cm⁻¹ with formation of the (MgMgMg)-OH-A-O²⁻ configuration; the repulsive interaction between the proton and the A cation is removed through dehydrogenation of OH at the O3 site, coupled with movement of the A cation toward the dehydrogenated side. In natural F- and Cl-bearing sodic-calcic and sodic amphiboles, two kinds of (MgMgMg)-OH-A stretching bands are observed at around 3730 and 3700 cm⁻¹, in which A-site alkali ions move toward the F⁻(Cl⁻)-substituted O3 site. In this manner, (MgMgMg)-OH-K and (MgMgMg)-OH-Na bands shift downward 20 cm⁻¹ and 26–29 cm⁻¹ by heat-treatment, respectively, reflecting the different size of the A-site cations.