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# Near-infrared study of short-range disorder of OH and F in monoclinic amphiboles

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## ABSTRACT

Amphiboles were synthesized along the joins tremolite–fluorotremolite, richterite–fluororichterite and potassic-richterite–potassic-fluororichterite at 750 °C and 1 kbar $P(H_2O)$. Infrared spectra of the amphiboles were recorded in the principal OH-stretching region. Amphiboles of the tremolite–fluorotremolite series show one-mode behavior, a single band due to a local MgMgMg-OH-$^A\square$ ($\square$ = vacancy) arrangement; this behavior is consistent with no coupling between NNN (next-nearest-neighbor) O3 anions either through the O3-O3 edge or across the vacant A-site cavity. The amphiboles of the richterite-fluororichterite and potassic-richterite–potassic-fluororichterite series show two-mode behavior, two bands due to the local arrangements MgMgMg-OH-$^A$Na-OH and MgMgMg-OH-$^A$Na-F (and their K equivalents); this behavior is consistent with coupling between NNN O3 anions across the filled A-site cavity through Na or K that occupies the A-site. A mathematical model is developed to describe local (OH,F) ordering in amphiboles as a function of F content. The variation in infrared band intensities is consistent with complete short-range disorder of OH and F in the synthetic amphiboles of the richterite-fluororichterite and potassic-richterite-potassic–fluororichterite series.