Abstract

Ferro-papikeite, ideally NaFe\(^{3+}\)(Fe\(^{2+}\)Al\(^{3+}\))(Si\(^6\)Al\(^{2+}\))O\(_{22}\)(OH)\(_2\), is a new orthorhombic amphibole from Nordmark (Western Bergslagen), Sweden: Description and crystal structure

INTRODUCTION

The general chemical formula of the amphiboles may be written (Hawthorne and Oberti 2007) as

\[ AB_2C_3T_4O_{22}W_2 \]

where \(A = \text{Na}^+, K^+, \text{Ca}^{2+}, \text{Li}^+; \ B = \text{Na}^+, \text{Li}^+, \text{Ca}^{2+}, \text{Mn}^{2+}, \text{Fe}^{2+}, \text{Mg}^{2+}; \ C = \text{Mg}^{2+}, \text{Fe}^{2+}, \text{Mn}^{2+}, \text{Al}^{3+}, \text{Fe}^{3+}, \text{Mn}^{3+}, \text{Ti}^{4+}, \text{Li}^+; \ T = \text{Si}^{4+}, \text{Al}^{3+}, \text{Ti}^{4+}; \ W = (\text{OH}), \text{F}, \text{Cl}, \text{O}^{2-}, \text{H}_2\text{O} \).

Rabbitt (1948) reviewed all previous work on orthorhombic amphiboles and described their composition as varying from Mg-SiO\(_2\)(OH)\(_2\) to Mg-Fe\(_2\)Al\(^{3+}\)Si\(^6\)Al\(^{2+}\)O\(_{22}\)(OH)\(_2\). Robinson and Jaffe (1969) and Robinson et al. (1971) found that amphiboles intermediate in composition between anthophyllite and gedrite are unmixted at the microscopic or submicroscopic scale along lamellae parallel to (010), and Stout (1971) confirmed the presence of a solvus by finding coarse coexisting orthorhombic amphiboles. Schindler et al. (2008) and Hawthorne et al. (2008) refined the crystal structures of 25 anthophyllite-gedrite amphiboles mainly from amphibolite-facies rocks and showed that their compositions closely follow the linear relation outlined by Robinson et al. (1971) from ideal anthophyllite to the composition Na\(_2\)Mg\(_3\)Fe\(^{3+}\)(Fe\(^{2+}\)Al\(^{3+}\))(Si\(^6\)Al\(^{2+}\))O\(_{22}\)(OH)\(_2\); where M\(^{2+}\) = Mg\(^{2+}\), Fe\(^{2+}\); M\(^{3+}\) = Al\(^{3+}\), Fe\(^{3+}\) (Ti\(^{4+}\)). Only six of their compositions equaled or exceeded 0.50 Na pfu (per formula unit) (maximum value = 0.56, mean value = 0.52 Na pfu). When the current amphibole nomenclature scheme was developed (Hawthorne et al. 2007), constituent of gedritic amphiboles, and Papike and Ross (1970) refined the structures of two gedrites and located Na at the A-site between the back-to-back ribbons of (Si,Al)O\(_2\) tetrahedra.