

Feldspars and feldspathoids I: Tetrahedral substitutions

The feldspars are among Earth's most abundant minerals and make up a large proportion of the crust. Feldspars are tectosilicates: minerals in which Si^{4+} and its substitutes share all four

tetrahedral O^{2-} s with other tetrahedra to make three-dimensional frameworks. This page begins an exploration of the feldspars by going through the simple algebra of feldspar chemical formulae.

Let's begin with the chemical formula for quartz, the most familiar silica mineral.



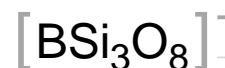
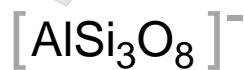
Let's quadruple that formula.



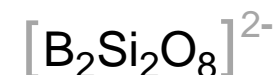
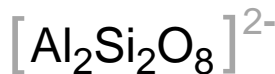
Common Feldspars
Rare feldspars

B^{3+} is an analog of Al^{3+} but is much less abundant than Al^{3+} . It substitutes for Si^{4+} to form rare feldspars.

Bearing in mind that Al^{3+} is an abundant cation near in size to Si^{4+} , let's substitute one Al^{3+} for one of the Si^{4+} .



The geometry of the tectosilicate structure will allow a second iteration of these substitutions, to give the unbalanced formulae at left and right.



The unbalanced formulae in brackets can have their charge balanced by 1+ and 2+ cations to give these generic mineral formulae.



Li^+	Be^{2+}	B^{3+}	C^{4+}
Na^+	Mg^{2+}	Al^{3+}	Si^{4+}
K^+	Ca^{2+}	Sc^{3+}	Ti^{4+}
Rb^+	Sr^{2+}		
Cs^+	Ba^{2+}		

This side of the diagram is the subject of Parts II and III of this series.

This side of the diagram is the subject of Part IV of this series.