

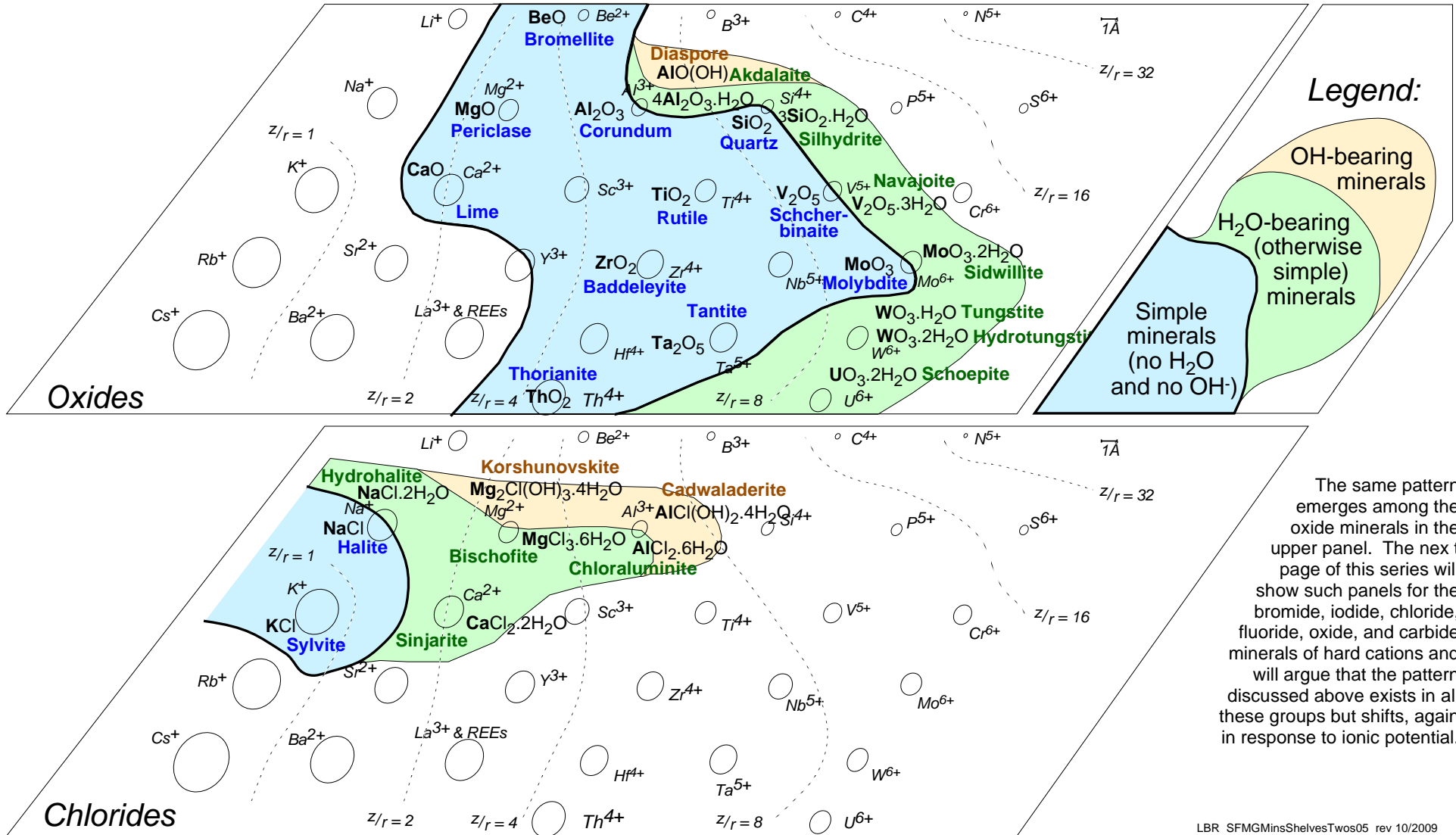
Patterns in the compositions of minerals IV: chlorides and oxides

This is the fourth in a series of pages presenting the chemistry of minerals in the context of part of the Earth Scientist's Periodic Table of the Elements and Their Ions. The first three pages were concerned with oxysalt or "-ate" minerals like carbonates and silicates, whereas this one and the next deal with "-ide" minerals, the minerals of simple anions like Cl⁻.

This page continues the argument that mineral compositions can be understood, and predicted, in terms of ionic potential. Ionic potential is charge divided by radius (z/r) and is a measure of density of charge. Ionic potential of cations increases from lower left to upper right across this part of the periodic table.

In the panel below showing the chlorides, cations of

low ionic potential like K⁺ and Na⁺ form simple minerals, but the low anionic potential of Cl⁻ fails to shield cations of higher ionic potential from each other, so that there are no simple chlorides of Mg²⁺ and Al³⁺. Instead, chlorides of Mg²⁺ and Ca²⁺ must also have H₂O to shield positive charges from each other, and minerals of Al³⁺ must have the counterbalancing negative charge of OH⁻.



The same pattern emerges among the oxide minerals in the upper panel. The next page of this series will show such panels for the bromide, iodide, chloride, fluoride, oxide, and carbide minerals of hard cations and will argue that the pattern discussed above exists in all these groups but shifts, again in response to ionic potential.