

American Mineralogist, Volume 90, pages 1033–1041, 2005

A synthesis of systematic mineralogy

L. BRUCE RAILSBACK

Department of Geology, University of Georgia, Athens, Georgia 30602-2501, U.S.A.

ABSTRACT

This paper presents several new diagrams that document previously unappreciated patterns and predictability in systematic mineralogy. They illustrate, for example, that sulfide minerals of single cations contain only intermediate to soft cations (cations with at least some outer-shell electrons). On the other hand, hard cations (those with no outer-shell electrons) only enter into a few sulfide minerals, all of which also contain intermediate cations. Among the simple chloride, fluoride, oxide, and carbide minerals of hard cations, ionic potential (charge/radius) of cations is proportional to that of anions (e.g., from KCl to SiC). Among the simple nitrate, sulfate, carbonate, phosphate, and silicate minerals of hard cations, ionic potential of inter-radical cations is inversely proportional to the ionic potential of the cations in the oxysalt radical (e.g., from KNO_3 to ZrSiO_4). Across both of these sets of minerals, non-simple minerals (H_2O - and OH^- -bearing minerals or minerals with extra O^{2-}) in each group typically involve cations of higher ionic potential than those of the simple minerals. The result is predictability and pattern in the compositions of minerals.