

## Comparative solubility of minerals IV: It's not about z/CN bond strength

Part I of these pages demonstrated an interesting result with regard to the solubility of minerals: for fluorides and oxides of hard cations, solubility *increases* with cation size, but among nitrates and sulfates of exactly the same cations, solubility *decreases* with increasing cation size (as shown by the black symbols in these cartoons).

One might think that solubility would be a function bond strength as calculated by cation charge ( $z$ ) ÷ coordination number (CN). However, the data for oxides disprove that contention, because according to it the fluorides griceite, villaumite, and carobbite, all with  $z = 1$  and  $CN = 6$ , would be expected to have the same

solubility (as suggested by the gray symbols and dashed lines). They don't. Likewise, periclase and lime, both of them with  $z = 2$  and  $CN = 6$ , would be expected to have the same solubility (as suggested by the gray symbols and dashed lines). They don't.

The data from sulfates even more dramatically disprove the "z/CN determines solubility" hypothesis, in that observed trends *among* cations of the same CN and *across* cations of different CN (black symbols) are counter to the predictions of the hypothesis (gray symbols). Instead, as suggested in Part II of this series, it's all about ionic potential and the resulting attractions and repulsions in mineral structures.

