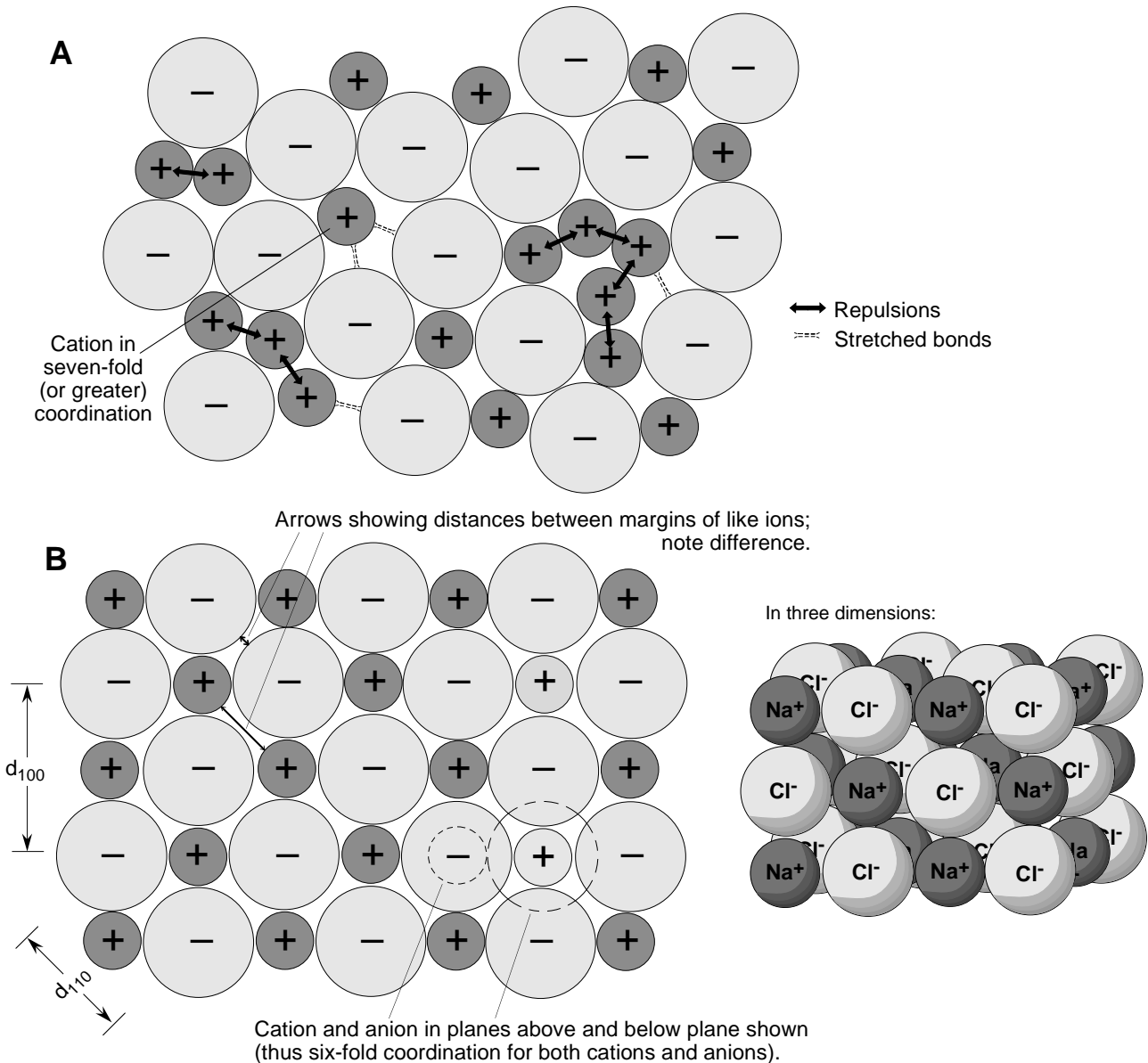


Crystallinity and mineral stability II

A more reasonable model of a mineral than that in "Crystallinity and mineral stability I" would acknowledge that cations are almost always smaller than anions (because the cations have lost electrons whereas the anions have gained them). Thus ionic potential (charge ÷ radius) of cations is almost always greater in absolute value than that of anions. As a result, repulsions between cations are a major constraint on crystal structures, whereas anions commonly touch (at least as we envision them) without significant repulsion.

Thus in Part A below we have a two-dimensional sketch of a hypothetical disordered arrangement of Na⁺ and Cl⁻ ions. Repulsions between cations and large cation-anion distances (and thus weak bonds) make this arrangement unstable. In contrast, the halite structure in B provides a stable arrangement that maximizes cation-cation distances, with each Na⁺ surrounded by six Cl⁻ ions.



To summarize: the most stable crystalline structures *minimize* distances between atoms that bond (which, in ionic crystals, are cations and anions) and *maximize* distances between cations.