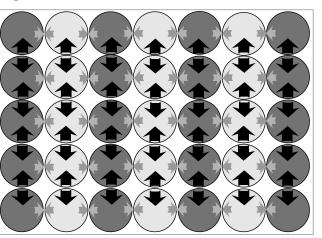
## Crystalinity and mineral stability I

Minerals are inevitably defined as "crystalline" solids. Crystalinity refers to a repeating geometric arrangement of atoms, such that the locations of just a few atoms allow prediction of the locations of the vast number of atoms in a single crystal. A correlative of this statement is that crystal structures consist of planes of atoms.

If one asks "why are stable solids crystalline?", the answer is apparent in the figure below. In a hypothetical solid in which positions of ions were completely random, repulsions would force cations apart (A). The structure would fall apart or rearrange itself to a configuration with fewer repulsions. Iterative rearrangement would ultimately lead to a stable configuration in which repulsions were minimized and attractions maximized (B). Repetition of that configuration through space leads to the regu-

Α

С



larity of structure that we call "cystallinity". With that said, one should appreciate that order does not necessarily convey stability. Example C at left is as ordered as is Example B, but its order establishes repulsions that would constitute a very unstable structure. Order that maxmimizes attractions (bonding) and minimizes repulsions is order that promotes stability.

The figure at left shows a very simple notion of crystal structure. One difference from reality is that in reality cation and anion are rarely of the same size: anions are almost always larger than the cations with which they form minerals. For a more realistic model. see "Crystallinity and mineral stability II".

LBR Crystallinity&StabilityI 02 9/2006

- A. Disorder and instability
- B. Order and stability
- C. Order and instability
- - Repulsion between ions of like charge
- Attraction between ions of opposite charge

Β

