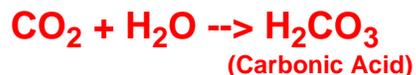


Carbon Dioxide in Soil

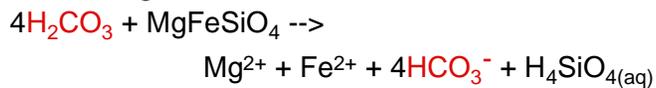
Carbon dioxide (CO₂) is much more abundant in soil gas (the air in soil) than in the atmosphere. That's because plant roots respire and produce CO₂, and because oxidative decay of organic matter produces CO₂. As a result, concentrations of CO₂ in soil gas are orders of magnitude greater than the atmospheric concentration, as is shown at right.

That's significant to geochemistry because CO₂ combines with water to make carbonic acid:

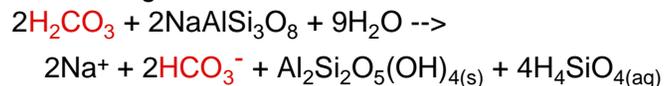


Carbonic acid in turn drives most chemical weathering by providing the acidity that attacks minerals. For example:

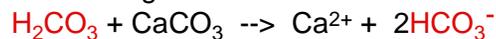
Weathering of olivine:



Weathering of albite:



Weathering of calcite:



Anyone who has taken physical geology might object that, although carbonate minerals react with acid, silicate minerals do not. The answer is that, although silicate minerals react slowly, they do react at geologic time scales. Anyone familiar with chemistry might object that carbonic acid is a weak acid, and that its acidity would quickly be expended by the slightest reaction with a mineral. The answer is that CO₂ is constantly replenished by plant respiration and decay, providing a long-term supply of weak acid.

The ultimate result is thus that the input of CO₂ portrayed at right is what drives chemical weathering, and it's what causes HCO₃⁻ (bicarbonate) to almost inevitably be the most abundant solute in groundwaters.

