CO₂ CHEMISTRY

The combustion of fossil fuels and organic substances produces CO₂. Such combustion also happens within our bodies. We emit CO₂ with the air we exhale. CO₂ in the air is an important greenhouse gas.

$$C_6H_{12}O_6$$
 (solid) + $6O_2$ (gas) \rightarrow $6CO_2$ (gas) + $6H_2O$ (water) + energy

CO₂ IN WATER

If CO₂ is dissolved in water it forms carbonic acid (H₂CO₃).

$$CO_2$$
 (gas) \longleftrightarrow CO_2 (dissolved) CO_2 (dissolved) \longleftrightarrow H_2CO_3 (dissolved)

Increased absorbtion of CO₂ in the oceans accounts for around one-quarter of human-made CO₂ emissions. H₂CO₃ is an acid that releases protons.

$$H_2CO_3$$
 (dissolved) \longleftrightarrow HCO_3^- (dissolved) $+$ H^+ (dissolved)

This causes the water to become more acidic (lower pH) and we get ocean acidification.



CO₂ IN SOILS

The concentration of CO₂ is much higher in soils than in the air. This causes the weathering of stones (CaSiO₃).

$$CaSiO_3$$
 (solid) + $2CO_2$ (gas) + H_2O (water)

 \longleftrightarrow
 Ca^{2+} (dissolved) + $2HCO_3^-$ (dissolved) + $2SiO_2$ (dissolved)

This process is important for regulating the CO₂ concentration in the air, but it is far too slow to have any significant effect on the increase of CO₂ concentration in the atmosphere.

Limestone is easily dissolved and can be used to show the effect of increased CO₂ on weathering.

$$CaCO_3$$
 (solid) + CO_2 (gas) + H_2O (water)

 Ca^{2+} (dissolved) + $2HCO_3^-$ (dissolved)

LAND

CaSiO₃ + 2CO₂ + H₂O \rightarrow Ca²⁺ + 2HCO₃ + 2SiO₂

WEATHERING

OCEAN

 $Ca^{2+} + 2HCO_3^- \rightarrow$ $CaCO_3 + 2CO_2 + H_2O$

SEDIMENTATION

CaCO₃ + SiO₂ → CaSiO₃ + CO₂ CONVERSION