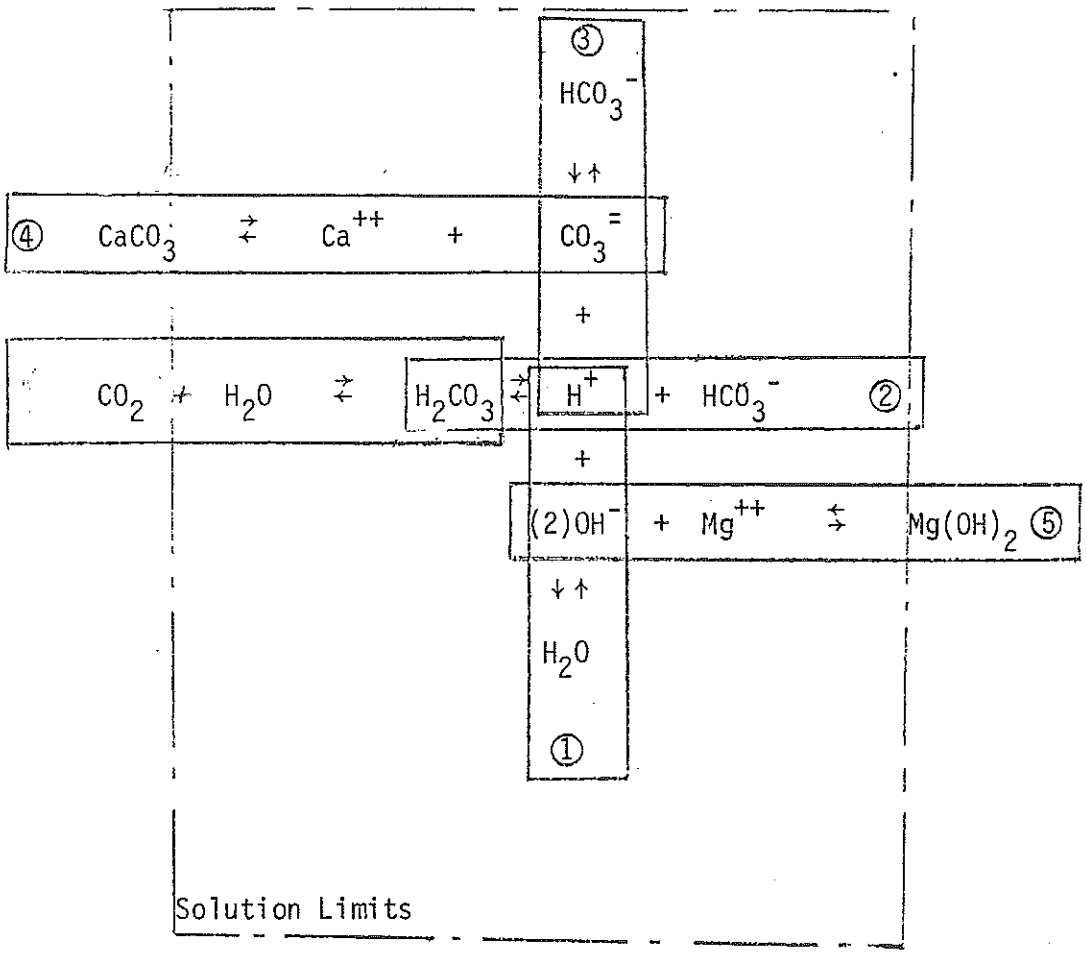
Carbonate Equilibria in Water Saturated with $CaCO_3$, $Mg(OH)_2$ and CO_2*



Equilibrium Expressions at 25°C:

① $[H^+][OH^-] = K_w = 1.00 \times 10^{-14}$

② $\dfrac{[H^+][HCO_3^-]}{[H_2CO_3]} = K_1 = 4.45 \times 10^{-7}$

③ $\dfrac{[H^+][CO_3^=]}{[HCO_3^-]} = K_2 = 4.69 \times 10^{-11}$

④ $[Ca^{++}][CO_3^=] = K_s = 4.82 \times 10^{-9}$

⑤ $[Mg^{++}][OH^-]^2 = K_s = 5.50 \times 10^{-12}$

* Adapted from Figure 7-2, Rich, L.G., Unit Processes of Sanitary Engineering, Wiley, N.Y., 1963.