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application and analysis of water-rock-carbon dioxide reaction using basalt

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Water-rock-CO_2 reaction is important in many parts of science. Main reactions are as follows.
$CO_2 + H_2O = H_2CO_3 = H^+ + HCO_3^-$ (1)
$MSiO_3 + 2CO_2 + H_2O = M^{2+} + H_4SiO_4 + 2HCO_3^-$ (2)
$M^{2+} + 2HCO_3^- = MCO_3 + CO_2 + H_2O$ (3)
M is divalent metal ion.

There are two steps. First, CO_2 dissolves into water at (1) and mineral($MSiO_3$) and water react with CO_2 at (2). Next, divalent metal ion and HCO_3^- react and precipitation occurs at (3).

We will apply it to the CO_2 underground sequestration and the estimate of Archean atmospheric CO_2 concentration and global carbon cycle and materials of subsystem.

Keywords: basalt, water-rock reaction, CCS, the dissolution rate constant, simulation