

Geochemistry and stable isotopes of some bicarbonated waters in South Korea

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Geochemical and isotopic analyses of carbonated waters in South Korea were carried out to investigate hydrogeochemical characteristics, behavior and source of dissolved ions including carbon species, and progress of water-rock interaction.

Most Korean bicarbonated waters from different geologic settings are characterized by a Ca-HCO₃ type with a relatively low pH ranging from 5.3 to 8.0 (avr. 6.2). The concentrations of cations and anions in carbonated waters are in the order of Ca²⁺>Na⁺>SiO₂> Mg²⁺>Fe²⁺>K⁺ and HCO₃⁻>SO₄²⁻>Cl⁻, respectively. The HCO₃⁻ ion is more enriched in bicarbonated waters from Mesozoic sedimentary rock and granitic rocks in the Gyungsang basin than those of the Precambrian metamorphic rock and Jurassic granitic rocks of the Gyunggi massif in the Gangwon province.

Based on the oxygen and hydrogen isotopic data, the carbonated waters are derived from the meteoric water, showing apparent latitude and altitude effects. The δ¹³C values of carbon species in the carbonated water are in between -6.23 and -0.04‰ (PDB), suggesting inorganic source of carbon originated from the carbonate mineral and carbonate rock in the aquifer.

Most chemical species in the carbonated waters are undersaturated with respect to carbonate and silicate minerals such as dolomite, magnesite, anorthite, chlorite, diopside and talc. In phase equilibrium of carbonates, dolomite, kaolinite and pyrophyllite are in a stable state in carbonated waters.