PREVIEW
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Geochemical evolution of cumulate-gabbro Interaction with Seawater and Supercritical CO_2 for Enhanced Mineral Carbonation. A study case.

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This study investigates the potential for mineral carbonation of carbon dioxide (CO_2) in plutonic basic rocks through a series of laboratory experiments conducted in two stages, under pressure (8 MPa) and temperature conditions (313.15 K) akin to those near a CO_2 injection well. Stage-I facilitated dissolution with crushed rock exposed to CO2 supersaturated seawater (0.6 M), while Stage-II promoted carbonation through cubic rock specimens in contact with CO_2 subsaturated seawater (0.1 M). A multi-analytical approach was employed to track the mineralogical and geochemical evolution of the rock and seawater. Brine analyses shows significant increases in iron, magnesium, and calcium ions, with reductions in silicon and aluminum levels. The solid phase showed minimal geochemical and mineralogical changes. Nevertheless, new mineral phases like halite and dolomite were detected by X-ray diffraction with a grazing geometry. In fact, although not detected on a bulk analysis, on the surface of specimens, and after the 120 days experiment, carbonate phases were detected. The geochemical model developed in the CrunchFlow code successfully replicated these observations and projected chemical behavior over longer periods. The findings suggest a promising potential for mineral carbonation in plutonic basic formations, though further studies are needed to scale the laboratory results to field applications.

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