Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.31843

Estimating carbon storage in water from a simple tool, the Deffeyes diagram.

AUBIN THIBAULT DE CHANVALON
CNRS/UPPA

Face to the development of new geoengineering processes, simple and accessible tools to ensure the reliability of carbon dioxide removal effort are an urgent need. We here (re)demonstrate the interest of the TA (total alkalinity) versus DIC (dissolved inorganic carbon plot) i.e. Deffeyes diagrams, to estimate by a simple read, the pH, pCO_2 and Ω_{sat} changes produced by any geochemical reaction in oceanic water. The Deffeyes diagrams interpretation is here improved thanks to a new algebraic definition of alkalinity, that is generic and independent of pH. Then using common mathematical approximations, we established the explicit formulation of the critical ratio of the TA/DIC changes at which the evolution of each parameter (pH, pCO_2 and Ω_{sat}) get inversed. On this base, main basic geochemical reactions controlling carbon cycle are surveyed, including weathering of different minerals and precipitation of sulfate-reduction products. Their interest for carbon storage is underlined.