

Monitoring of water quality during CO₂ mineralization experiments with Pitanga Formation from Parana Basalts

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It is well known that CO₂ capture and storage (CCS) is an attractive, and relatively new, technology to reduce emissions of CO₂ to the atmosphere, mitigating climate changes. However, as all kinds of new technology, it may cause adverse impacts on the environment. Herein it was evaluated the release of metals and metalloids to water during a series of experiments of CO₂ mineralization conducted on basalt/rock reactions. The experiments were carried out in a batch hydrothermal reactor, using a high-Ti basalt (TiO₂ ≥ 2wt%), from the Pitanga Formation, and high ionic strength water, at 150 °C and 80 bar partial pressure of CO₂. The reaction time evaluated, up to now, was 5 and 10 days. The water-to-rock ratio was 5 to 1. After each experiment, reaction fluids were filtered, acidified and stored until the analysis, by Inductively Coupled Plasma Mass Spectrometry and Atomic Absorption Spectrometry, be performed. The high-salinity water used for the reaction was also analyzed, for comparison. The elements Al, As, Ba, Ca, Cd, Co, Cr, Cs, Cu, Fe, Hf, Hg, K, Mg, Mn, Mo, Na, Nb, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ta, Ti, Tl, U, V, W and Zn were quantified. As, Hf, Hg, Nb, Sb, Se, Sn, Ta, Tl and U showed concentrations below the limit of detection and/or below 1 ppb for all fluid samples. Moreover, Al, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Rb, Sr and Zn showed an increase in concentration, after 5 days experiment and a subsequent decrease, for the 10 days experiment. Cd and Ni concentrations exceeded the maximum allowed limit of the Brazilian legislation for potable water in the 5 days run experiment. The high mobility observed for 5 days could be occasioned by the low pH values observed during this experiment, of 3.5-4.5. For 10 days there is an increase in pH (4.8-5.2) which may be causing the reprecipitation of these elements, probably in the form of carbonate. Experiments with extended reaction times are being conducted to produce more robust conclusions about the mobility of elements during CO₂ mineralization tests.