

口頭講演 | S2: 岩石-水相互作用 (スペシャルセッション)

2026年9月25日(金) 14:15 ~ 18:00 | C 会場 (287号室)

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座長: 土屋 範芳、宇野 正起

ハイブリッド形式で開催します。オンラインで参加される場合は「オンライン会議に参加」をクリックしてください。

15:55 ~ 16:10

[S2-07] Improved dissolution of serpentinized peridotite facilitated by a biodegradable chelating agent

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キーワード : GLDA-Na4、Ultramafic rock、Natural hydrogen、Serpentinization、CO₂ mineralization

As the global transition toward carbon neutrality accelerates, natural hydrogen generated by serpentinization of ultramafic rocks and CO₂ mineralization in ultramafic formations have emerged as promising strategies for low-carbon energy production and long-term geological carbon storage. Although mantle-derived rocks such as peridotites have high potential for natural hydrogen generation, their practical exploitation is limited by extremely low permeability at depth. Furthermore, despite the widespread occurrence of serpentinized ultramafic rocks, their dissolution behavior remains poorly constrained. Therefore, this study investigates the effect of serpentinization on peridotite dissolution using the biodegradable chelating agent GLDA-Na4 to enhance mineral dissolution and improve resource extraction. Peridotite samples collected from Mount Iwanaidake were classified into four groups (IW1–IW4) according to their degree of serpentinization. Batch shaking experiments on moderately serpentinized IW2 sample were conducted to optimize GLDA-Na4 concentration (1 %, 2 %, 5 %, 10 %, and 20 % experiments), and solution pH (1, 2, 4, 6, 8, and 10 experiments) with and without GLDA-Na4 at 35 °C for 6 hours. At pH 4 and 35 °C, the Mg concentration in the GLDA-Na4-experiment (907 mg/L) was 140 times higher than that in the GLDA-Na4-free experiment (6.5 mg/L). Then all samples were reacted with GLDA-Na4 10 % and solution pH 4 at temperature (20, 35, and 60 °C) for 6 hours. Mg concentrations increased from 464–2242 mg/L at 20 °C to 899–2584 mg/L at 35 °C and 1324–2483 mg/L at 60 °C. Likewise, Fe concentrations increased from 103–636 mg/L at 20 °C to 189–720 mg/L at 35 °C and 337–710 mg/L at 60 °C, demonstrating an overall positive correlation between metal release and temperature. The results demonstrate that increasing serpentinization did not significantly decrease total iron extraction. Microscopic observations from rock chip revealed contrasting dissolution mechanisms: fresh peridotite preferentially dissolved along cracks within olivine, whereas serpentinized peridotite exhibited selective dissolution of olivine, and brucite and magnetite associated with mesh textures. These findings suggest that GLDA-Na4-assisted dissolution is a promising approach for enhancing stimulation of natural hydrogen reservoirs, recovering iron from ultramafic rocks (fresh and variably serpentinized) under realistic geological conditions, and promoting the extraction of divalent metals for subsequent CO₂ mineralization.