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ABSTRACT:

Hydrogen Generation from Water-Peridotite Reaction

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Recently, naturally generated underground hydrogen known as “White Hydrogen” has attracted great attention as a potentially large hydrogen resource [1]. Previous studies [2-4] have suggested that the primary formation mechanism of natural hydrogen is the serpentinization of iron-bearing lithologies, such as peridotites, through interactions with water under high-pressure and high-temperature subsurface conditions. Panthi et al. [5] have conducted a lab-scale experiments using pulverized peridotite rocks and successfully detected H2 generation. However, the controlling factors of hydrogen generation through such water–rock reactions have not yet been fully understood. Mechanochemical treatments achieve far-from-equilibrium conditions by locally generating high pressure and temperature at impact sites, where the hydrogen-generation conditions described above may also be reproduced via the mechanochemical processes in the presence of water and peridotites. In this study, we conducted preliminary investigations of water–rock reactions and the associated hydrogen generation induced by mechanochemical treatment, combined with additional external heating to accelerate the reactions. The resulting hydrogen-generation behavior is compared with and discussed in relation to that obtained solely from thermal reactions.

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