

Exploration perspective of natural hydrogen in China

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In China, natural hydrogen has been drawn the attention of more and more scholars and Institutes. It is reported that more than ten hydrogen seepages have been find in China from 2001 to 2024.

By reviewing the global cases of natural hydrogen exploration, it is concluded that the water-rock reaction in iron-rich rocks is the most significant source of natural hydrogen generation. Globally, natural hydrogen is hosted in various geological settings, of which the three most dominant, including subduction zones, rift zones, and Precambrian BIFs, provide favorable conditions for generating and migrating natural hydrogen. China has favorable geological conditions for natural hydrogen generation and accumulation and has broad prospects for the exploration and development of natural hydrogen, especially in plate subduction zones, Precambrian iron-rich strata, and rift zones. Ophiolites and Precambrian BIFs are important hydrogen-generating source rocks. The ophiolite belts (plate subduction zones) are mainly distributed in four regions: the ophiolite belt on the southern margin of the Central Asian Orogenic Belt, the Qinling-Qilian-Kunlun ophiolite belt, the Pacific Rim ophiolite belt, and the Sanjiang ophiolite belt. The Precambrian BIFs in China are mainly developed in ancient cratons such as the North China, Tarim, and Yangtze. Since the Mesozoic-Cenozoic, eastern China has been affected by the uplift of the Qinghai-Tibet Plateau and the subduction of the Pacific Plate, resulting in the formation of a series of extensional basins under the dual effects of multiple strike-slip and extensional structures. Deep fluid activities in these areas are vital, accompanied by basic and ultrabasic magmatic activities, indicating superior hydrogen generation and migration conditions.

Based on the existing geological data and natural hydrogen seepage in China, it is suggested that natural hydrogen exploration should be prioritized in the following five key zones: (1) Intracontinental rift zones in the Songliao Basin; (2) Overlap areas of BIFs and extensional basin in the North China Craton; (3) Developing zones of BIFs or large igneous provinces in the Tarim craton; (4) Southwest margin of Yangtze Plate; (5) Sanshui Basin.