Understanding geologic hydrogen resource potential

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The notion that economic accumulations of natural hydrogen do not exist on Earth has recently been challenged [1], and there is a growing acknowledgement that geoscientists have not looked for natural hydrogen in the right places with the right tools. Model predictions based on known behavior of hydrogen in the subsurface and geologic analogues indicate a global resource potential in the millions of megatonnes (Mt), which could meet projected demand for thousands of years [2]. Although much is known about the occurrence of subsurface hydrogen (e.g., generation mechanisms, consumptive processes, etc.), our understanding of the processes and settings that are most conducive to the formation of significant accumulations of hydrogen is still evolving. A preliminary "hydrogen system" model has been developed for understanding the potential generation of economic accumulations of hydrogen resources in the Earth's subsurface based on the "petroleum system" concept [3]. The essential components that make up the models (e.g., source, migration pathway, reservoir, seals, etc.) are the same but the details of each of the components vary and are not always directly comparable. The individual components of the hydrogen system (with associated uncertainties) have been mapped across the conterminous U.S. to provide a preliminary estimate of the most prospective regions for discovery of geologic hydrogen resources. This presentation will discuss the current state of geologic hydrogen prospectivity mapping and highlight the areas of greatest need for research that will improve our understanding of natural hydrogen resource potential and help inform the development of exploration strategies.

References

[1] Gaucher, E.C., 2020, New Perspectives in the Industrial Exploration for Native Hydrogen: Elements, v. 16, no. 1, p. 8-9, https://doi.org/10.2138/gselements.16.1.8.

[2] Ellis, G.S. and Gelman, S.E., 2022, A preliminary model of global subsurface natural hydrogen resource potential, Geological Society of America Annual Meeting October 9-12, 2022, Denver, Colorado, Geological Society of America Abstracts with Programs, v. 54, no. 5. https://doi.org/10.1130/abs/2022AM-380270

[3] Ellis, G.S., 2022, Mapping prospective regions for natural hydrogen resources in the US, Geological Society of America Annual Meeting October 9-12, 2022, Denver, Colorado, Geological Society of America Abstracts with Programs, v. 54, no. 5, https://doi.org/10.1130/abs/2022AM-378030.