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Leveraging Large Language Models and Generative AI in Pore-Scale Modeling for Enhanced Hydrogen and Carbon Storage

The transition to sustainable energy sources necessitates advanced technologies for efficient hydrogen and carbon storage. Pore-scale modeling plays a crucial role in understanding the intricate mechanisms within geological formations. This study explores the transformative potential of Large Language Models (LLMs) and Generative Artificial Intelligence (AI) in enhancing pore-scale modeling. A comprehensive overview of traditional pore-scale modeling methods is provided, followed by an examination of recent advancements driven by AI. The capabilities of LLMs and generative AI are highlighted, emphasizing their potential to improve the accuracy of pore-scale simulations, reduce computational costs, and enhance predictive capabilities while reducing the need for extensive physical imaging.

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