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Transfer Learning Framework for Predicting Geomechanical Properties from Mineralogy: Enhancing Caprock Integrity Assessment in Alberta's Clearwater Shales for Safe Carbon Storage

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Summary

Scarcity of core samples often hinders caprock risk assessment. We present a transfer learning framework (Peng et al., 2026) that predicts geomechanical properties directly from mineralogy. Validated on experimental results of Alberta's Clearwater shales (Zeng et al., 2025), our model accurately predicts fracture pressure and Poisson's ratio, proving that storage integrity remains high despite CO2-induced alterations. This provides a scalable, data-driven pathway for quantifying safety in carbon storage operations.

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