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Experimental and simulation research on the influence of temperature on the porous and thermal properties of sandstone

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In the process of thermal recovery and the underground storage of nuclear waste, the porosity and permeability of rock will change significantly from thermal stress. In this paper, a sandstone sample was subjected to heating, porosity examination, permeability measurements and CT scanning. Based on digital core technology, permeability and thermal conduction simulations were performed. The results show that due to the discontinuity character of thermal cracking, as the temperature increases, the permeability of sandstone increases with fluctuations, resulting in a final value that is higher than the initial value. The permeability of the pore network model is fit to the experimental permeability, whereas the fractal model exhibits a closed relationship with the pore throat diameter. The thermal conductivity simulation shows that due to the porosity's changing with the temperature, the thermal conductivity coefficient exhibits an opposite fluctuating change.

References

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Primary authors: Ms YANG, Haiyuan (China University of Petroleum (East China)); Prof. YANG, Yongfei (China University of Petroleum （East China）)

Presenter: Ms YANG, Haiyuan (China University of Petroleum (East China))

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