

光ファイバーによるCO₂圧入の検知； 長尺コア試料の例 Detection CO₂ flooding by optical fiber; Example of a long core specimen

*朴 赫¹、Jiang Lanlan¹、Zhang Yi¹、木山 保¹、薛 自求¹

*Hyuck Park¹, LANLAN JIANG¹, Yi Zhang¹, Tamotsu Kiyama¹, Ziqiu Xue¹

1. 公益財団法人 地球環境産業技術研究機構

1. Research Institute of Innovative Technology for the Earth

We challenged the detection of CO₂ by optical fiber in a laboratory experiment using porous sandstone. We also observed the fluid movement in the specimen by performing CT image analysis at the same time. It is possible to obtain the specimen porosity and fluid saturation process by using CT image analysis. Berea sandstone (diameter: 34.85mm, length: 288mm) was used in this study. Porosity of specimen determined by X-ray CT imaging is 19.70%. This specimen has thin layers parallel to the specimen axis, and the permeability is about 130 mD. The experiment was conducted under the pressure and temperature conditions that simulate underground environments; pore pressure: 10MPa, temperature: 40 degrees Celsius. The confining pressure selected in this study is 15MPa. The specimen was first saturated with KI aqueous solution (11.5 wt%). For the CO₂ flooding, we maintained the upstream CO₂ injection rate at 0.05 mL/min. The CO₂ flooding was carried out until the total fluid injection reaches about 3PV (pore volume). Optical fiber measurement and X-ray CT imaging were performed in all experimental steps. Figure shows the detection results of CO₂ in optical fiber measurement and X-ray CT imaging. According to the results, the movement of CO₂ detected by optical fiber measurement is in good agreement with that obtained by X-ray CT. This suggests that optical fiber measurement is effective for detecting the movement of CO₂ in the rock.

キーワード：光ファイバー計測、X線CT、CO₂フラッド、CO₂飽和度

Keywords: Optical fiber measurement, X-ray CT, CO₂ flooding, CO₂ saturation

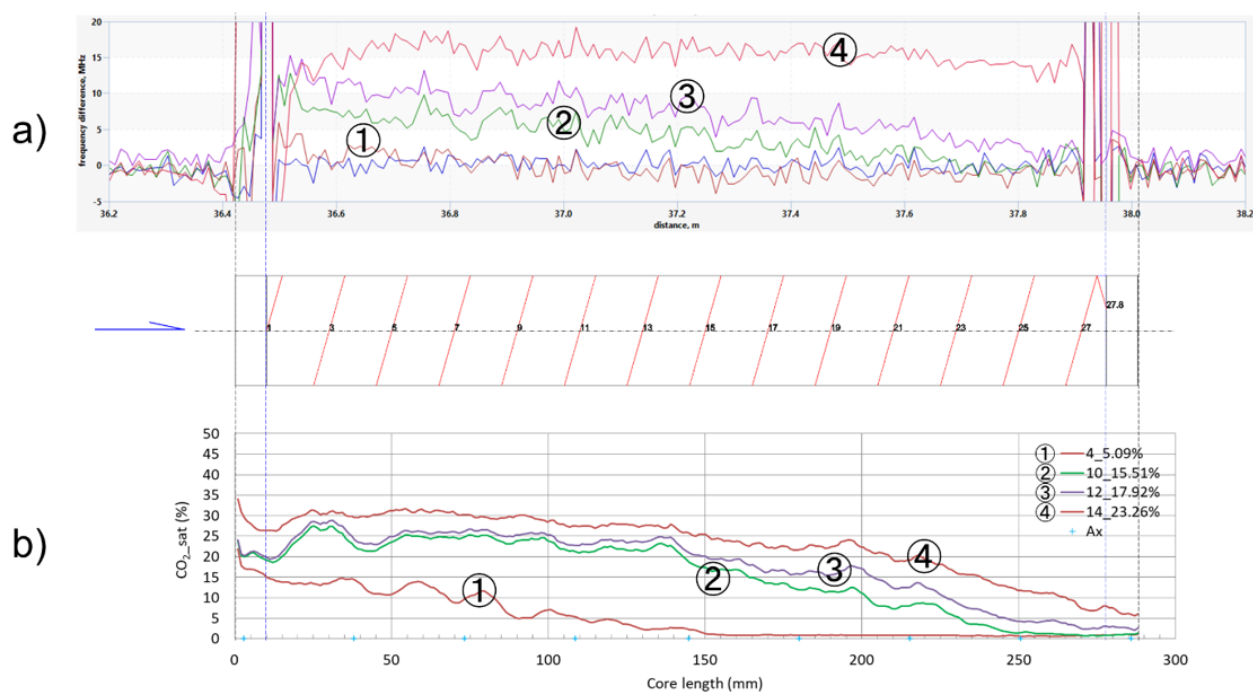


Figure. CO₂ flooding detected by optical fiber measurement and X-ray CT imaging. The circled numbers are the same point in time. a) optical fiber measurement result, b) CO₂ saturation along the specimen axial direction