

Geomechanical monitoring of caprock and wellbore integrity using fiber optic cable

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We have been developing a new technology to monitor the caprock and wellbore integrity at CO₂ injection sites by utilizing the Distributed Fiber Optic Sensing (DFOS). DFOS has an advantage to measure temperature and strain at any point in an unprocessed optical fiber, contrary to the conventional Fiber Bragg Grating (FBG) sensing which measures temperature and strain at a limited number of discrete points along the processed fiber cable. To put the DFOS technique into the practical use at the CCS sites, we measured the frequency shifts of the Rayleigh and Brillouin scattering in an optical fiber attached to sandstone samples under hydrostatic pressure, and also measured strain of the samples by conventional strain gages simultaneously. Strains measured by optical fiber are estimated based on the frequency shifts and those strains agreed well with the strains by conventional strain gages. The experimental results demonstrated the potential use of DFOS as a promising technology for monitoring the geomechanical deformation of geological formation at the CO₂ injection site.

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