

## **Development of On-site pCO<sub>2</sub> Analyzing System and Evaluation of its Applicability to Identify CO<sub>2</sub> Intrusion into Groundwater**

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Partial pressure of CO<sub>2</sub> (pCO<sub>2</sub>) of groundwater is one of sensitive parameters to identify CO<sub>2</sub> intrusion into groundwater from CO<sub>2</sub>-stored reservoir. Despite of its potential as primary leakage indicator, many studies related to CO<sub>2</sub> leakage did not consider its importance because of the lack of direct monitoring technique. Open-loop and air-purging system (OLAPs) was developed to measure pCO<sub>2</sub> of groundwater and applied two field scale artificial CO<sub>2</sub> injection tests (Type 1: dissolved CO<sub>2</sub>; Type 2: gaseous CO<sub>2</sub>). During the type 1 injection test, pCO<sub>2</sub> elevated from 0.002 to 1.157 atm due to mineral reaction, which was corresponding to EC and alkalinity increase. During the type 2 test, however, pCO<sub>2</sub> elevated from 0.003 to 0.286 atm, although more CO<sub>2</sub> was injected than the type 1 test because large amount of injected gas escaped as free phase gas. Despite of relatively low pCO<sub>2</sub> than previous test, EC increased more. It can be inferred that gas phase intrusion can affect a larger space around the injection point than the dissolved phase intrusion. In addition, the results showed that pCO<sub>2</sub> was the most sensitive to CO<sub>2</sub> injection compared to other parameters, which indicated that pCO<sub>2</sub> can detect sensitively the CO<sub>2</sub> intrusion into shallow aquifer system.