# Visualization experiment of dissolved $CO_2$ plume transport in shallow-depth groundwater condition

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## 1. Introduction

Transport of dissolved $CO_2$ plume is an important study area for establishing an efficient monitoring system in $CO_2$ sequestration sites. Degassing, dissolution, and gas trapping in pores of saturated/unsaturated zones can cause decoupling of CO2 plume transport and groundwater flow in their direction and velocity.

## 2. Visualization method

Bromocresol ($C_{21}H_{16}Br_2O_5S$) purple is a discolored solution that can be affected by an oxidation-reduction reaction. Yellow-colour means acid and purple-colour means basic. Using this solution, dissolved $CO_2$ transport can be visualized.

## 3. Laboratory experiment set

2-D transparent acrylic box (60 cm long, 50 cm high and 0.4 cm thick) packed with medium size beads (0.75-1.0 mm) was used to form a density-dependent transport of dissolved CO2 plume. Experimental instrument for circulation of $CO_2$-infused water was attached at the left and right sides of the box and this gear can make constant flow condition during the experiments (Figure 1a). $CO_2$ dissolver shown in Figure 1b illustrates how dissolved $CO_2$ water was made.

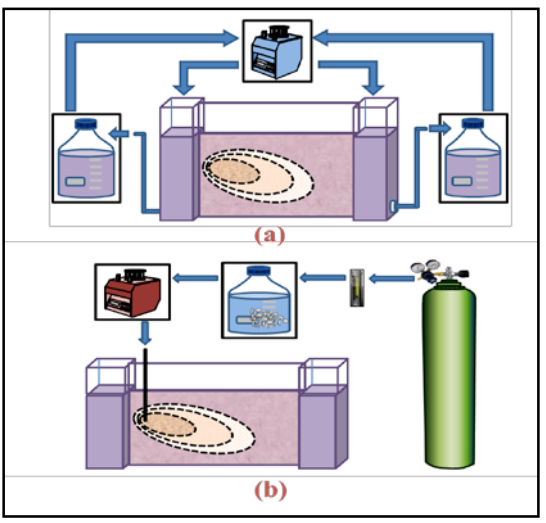


**Figure 1** Experimental setup for flow generation (a) and generation of $CO_2$ dissolved water for injection (b).

## 4. Conclusion

Our experiment indicated that the dissolved $CO_2$ plume has density effect in its transport and this property need to be considered in designing groundwater monitoring networks for detecting a $CO_2$ plume.