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An effect of CO_2 leakage from deep geological formations on the quality of shallow aquifers

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Injection of CO_2 into deep geological formations is a promising technique for Sequestration of large amount of CO_2. If some fraction of the stored CO_2 were to leak and reach shallow groundwater aquifers, however, it would lead to geochemical alteration that could have detrimental effects on the water quality. A series of experiments were performed on dissolution kinetics of a trace metal, galena, to evaluate the change in groundwater pH and the enhanced dissolution as carbon dioxide introduces into the aquifer. The conventional rate law was applied to obtain reaction parameters on dissolution kinetics for further modeling studies. The results from batch experiments and kinetic analysis were applied to develop a 1D mathematical model to simulate the fate and transport of dissolved trace metals in shallow aquifers. Results show that CO_2 dissolution in groundwater aquifers can solubilize trace metals to levels that exceed drinking water standards. This approach allows for a reasonable assessment of the risks on tha quality of freshwater aquifers due to the escape of CO_2 from deep geological formations.