

## Evaluation of common hydrological tracers in porous rocks

Tracer tests play a vital role in geohydrology to study the groundwater flow and characteristic behavior of their subsurface layers. Dyes are one of the common tracers used for tracer tests. The basic presumption of tracer test results is that the tracers should not react with the experimental solutions or to the solid materials. The evaluations of the results were based on the reactivity of the tracer tests.

Six common hydrological tracers were investigated namely amino G acid, amino rhodamine G, fluorescein sodium salt, naphthionic acid, rhodamine B and pyranine in solutions of pH 3, 6.5 and 9 with three porous rocks basaltic glass, quartz and rhyolite respectively. Tracers were pumped at fixed flow rates through the polytetrafluoroethylene column packed with rock grains and the tracer concentration was monitored at the outlet of the column using spectrophotometer. A breakthrough curve was thus generated. The measured breakthrough tracer curves were compared to theoretical 1-D reactive transport simulations calculated using the PHREEQC program. The three tested tracers were observed reactive, non-reactive and tracers that are either reactive or non-reactive depending not only on their intrinsic characteristics but also on rock type. Reactive tracers are affected by adsorption and desorption reactions. The results suggest that some of the tracers commonly used in ground water tracer tests are not suitable under all conditions as they may react with the rocks of the groundwater system.

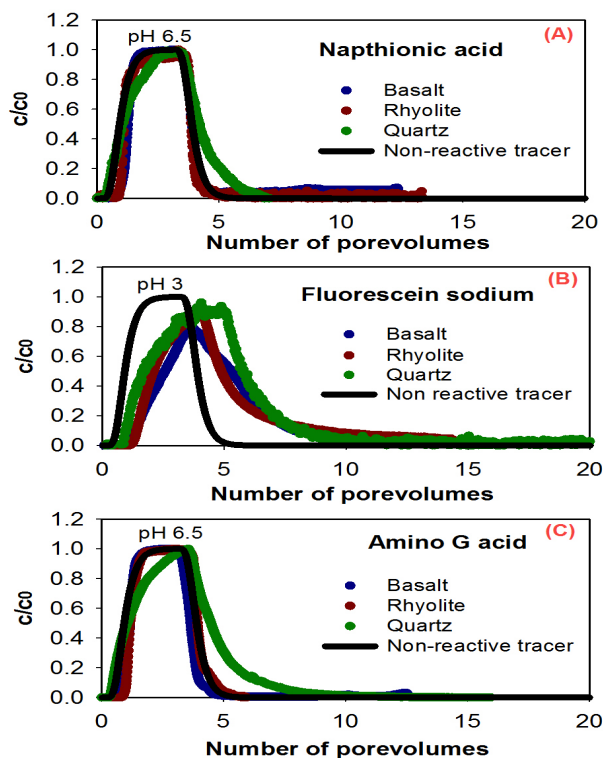


Fig1. Break through curve of non-reactive (A), reactive (B) and partially reactive (C) tracers