**EXPERIMENTAL STUDY ON CONTAMINATED GROUNDWATER**

**ABSTRACT**

A quantitative understanding of the transport of pollutants in groundwater is of great importance from the environmental perspective. Some environmental pollution scenarios involving groundwater contamination are very real. For example, one may encounter a situation where an underground storage tank is leaking hydrocarbons into an aquifer at a constant rate. Similarly, an overturned oil tanker spilling fuel that might flow through the sandy soil and find its way to the groundwater aquifer leading to its contamination. Especially in the Kingdom where fossil-water resources are not very abundant and, therefore, their contamination is something which scientists and engineers of the Kingdom can least afford not being ready to handle. The first step in this direction is to understand the flow and transport mechanisms of pollutants in groundwater to quantify their effects before any effective in situ remediation or extraction strategies could be suggested. Experimental study in a laboratory is carried out in order to gain a quantitative understanding of the main transport mechanisms of pollutants in groundwater. In this connection, residence time distribution (RTD) studies were carried out in a saturated but homogeneous porous medium with superimposed ambient water flow to simulate the groundwater flow. The porous medium was constructed using a non-porous and inert plastic resin in order to eliminate the internal and external mass transport resistances, thereby simplifying the mathematical model and the subsequent processing of the data. To this end, experiments were carried out using a non-reactive salt tracer instead of a pollutant to avoid the disposal and safety problems associated with their handling. The main focus of the present experimental study was to investigate the effect of the molecular diffusivity of the tracer on the dispersive transport or the spread of the pollutant. This was achieved using two different salt tracers of significantly different diffusivities. Pulse injections of tracers were made and their concentrations were monitored in situ downstream with the help of specially designed conductivity probes. The data thus obtained were processed in conjunction with the one-dimensional dispersion model to obtain the degree of dispersive transport as function of water flow for both cases of salt tracers of different molecular diffusivities