



Dr. Tom Al

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Tom Al obtained his PhD from the University of Waterloo in 1996. He worked as Professor at the University of New Brunswick until he moved to the University of Ottawa in 2015. Tom teaches Hydrogeology and Aqueous Inorganic Geochemistry and Modelling, and manages a team of post-graduate students and staff on the different research projects. The work that Tom and his team is involved with makes use of a wide range of state-of-the-art analytical techniques to determine the chemical and isotopic composition of rocks, minerals and water, and to understand the transport and reaction of solutes in groundwater systems.

Fields of Interest

- Geochemistry
- Hydrogeology
- Solute transport
- Waste management
- Water-rock interaction

Tom's research is focussed on understanding geochemical reaction processes between groundwater and minerals that affect the transport and distribution of natural and anthropogenic (contaminant) species. This involves aqueous geochemistry, mineralogy and hydrogeology. The research is commonly tied to the need to ensure secure management of waste materials from industries such as metal mining and nuclear power generation, but also involves studies of natural and anthropogenic contamination in aquifers. In many cases, advancement of the science requires development of new experimental and measurement techniques. Examples include the following:

- Development of spectroscopic methods for measuring nanoscale oxidation state changes in minerals adjacent to fractures in bedrock, as an aid to predicting the depth of penetration of potentially corrosive oxidizing fluids in potential host rocks for a geological repository of radioactive waste
- Development of non-destructive x-ray imaging techniques for measuring diffusion properties of rocks
- Characterization of pore-water geochemistry in low-permeability sedimentary rocks

Selected Papers

Selected Publications

Loomer, D.B., L. Scott, T. A. Al, K. U. Mayer and S. Bea. 2013. Diffusion-reaction studies in low permeability shale using X-ray radiography with cesium. *Applied Geochemistry*, 39: 49-58.

Loomer, D.B., T.A. Al, V.J. Banks, B.L. Parker, K.U. Mayer. 2010. Manganese and trace-metal mobility under reducing conditions following in situ oxidation of TCE by KMnO_4 : A laboratory column experiment, *Journal of Contaminant Hydrology*, 119: 13-24.

Cavé, L.C., Al, T.A., Xiang, Y. and Vilks, P. 2009. A technique for estimating one-dimensional diffusion coefficients in low permeability sedimentary rock using X-ray radiography: Comparison with through-diffusion measurements. *Journal of Contaminant Hydrology*, 103: 1-12

Agbogun, H.M.D. T.A. Al and E.M.A. Hussein. 2013. Three Dimensional Imaging of Porosity and Tracer Concentration Distributions in a Dolostone sample during Diffusion Experiments using X-ray Micro-CT, *Journal of Contaminant Hydrology*, 145: 44-53.

Petrunic, B.M., T.A. Al, L. Weaver and D. Hall. 2009. Identification and Characterization of Secondary Minerals Formed in Tungsten Mine Tailings Using Transmission Electron Microscopy. *Applied Geochemistry*, 24: (12), 2222-2233.