# Effects of cations and pressure on the structure of aqueous solutions as evidenced by IR OH bands

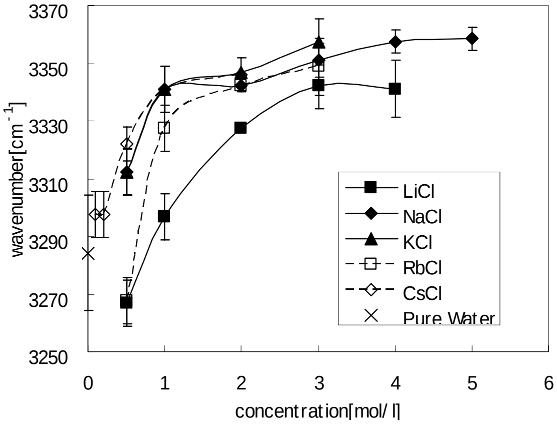
T. SAWAI AND S. NAKASHIMA

Department of Earth and Space Science, Graduate School of Science, Osaka University, 1-1 Machikaneyama-cho, Toyonaka-shi, Osaka 560-0043, Japan. (tsawai@ess.sci.osaka-u.ac.jp)

In order to study effects of cations and pressure/temperatures on the structure of aqueous solutions, infrared (IR) spectra were measured for salt solutions under different pressures/temperatures.

IR spectra of synthetic salt solutions (LiCl, NaCl, KCl, RbCl, CsCl, $MgCl_2$ , $CaCl_2$, $SrCl_2$ , $BaCl_2$ ) were measured by attenuated total reflection (ATR)-IR spectroscopy at room temeprature under atmospheric pressure. The peak positions of OH stretching bands shifted to higher wavenumbers with increasing salt concentrations.

**Figure 1**: The peak positions of OH stretching bands.



By taking difference spectra from the pure water, the higher wavenumber component (3430 cm$^{-1}$) increases, while the lower wavenumber component (3170 cm$^{-1}$) decreases for most of the salt solutions. The addition of these salts to pure water resulted in the increase of water molecular clusters with longer H-bond distances.

In order to measure IR transmission spectra of fluids at different pressurre/temperature conditions, a high pressure/temperature IR transmission cell has been developped to be used under an IR microscope.

First, IR spectra of pure water was measured at different pressures from 0.1 to 15.6 MPa. The OH stretching peak position did not change significantly upto 15.6 MPa. The above salt solutions are now being examined at different pressure/temperature conditions.

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# Geochemestry of Kairouan plain, Tunisia

RIM SAYADI[1], RACHIDA BOUHLILA[2] AND MUSTAPHA BESBES[3]

[1]Ecole Nationale d'Ingénieurs de Tunis, Tunisie-rim_sayadi@hotmail.com
[2]Ecole nationale d'Ingénéieurs de Tunis, Tunisie-bouhlila.rachida@enit.rnu.tn
[3]Ecole nationale d'Ingénéieurs de Tunis, Tunisie-mbf.besbes@gnet.tn

The aquifer of Kairouan, located in the central part of Tunisia, is the main water resource for drinking supply, agriculture and industrial use in the region. It is composed of a shallow and a deep units and its main feeding comes from natural recharge in wadiis. Because of the demographic, agricultural and industrial development in the region, the aquifer knows an increasing exploitation with more than 5000 wells and 400 drillings. The actual exploitation volume exceeds the aquifer capacity and thus can threaten the water quality there. The main risks are dealing with deep saline water upcoming and Sebkha water intrusion. Another risk can come from irrigation water recycling which can only be very saline because of the climate aridity in the region.

In this work, we present the main results of a geochemical study of Kairouan aquifer. Major elements were used to identify the water types and a statistical study was performed to determine the salinity origin as well as the inter connection between the surface water and the two aquifer layers.

The richness of the mineralization by different major elements has been explained by the probability of rocks alteration, meteoric contribution and salt migration in the atmosphere from Sebkhas that constitute the Kairouan groundwater outlet.

## Reference

Sayadi R. (2006). *Géochimie de la plaine de Kairouan.* MSc in Ecole Nationale d'ingénieurs de Tunis-Tunisie, 200p.