Measurements, modelling and applications of the electro-kinetic properties of rocks

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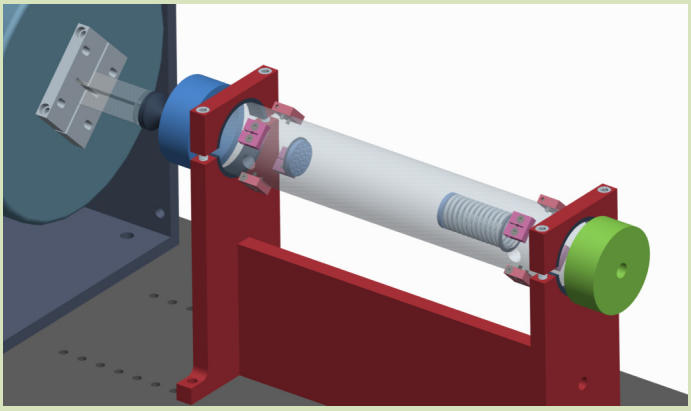
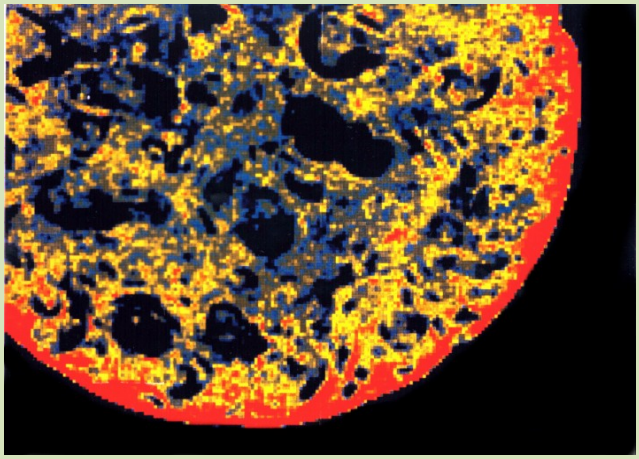


Recent years have seen a large increase in the study and application of the electro-kinetic and electro-seismic properties of rocks. The electrical double layer that exists between the minerals that form the rock matrix and the bulk electrolyte that saturates the pores of the rock is now fairly well understood, at least in the steady state. It is the presence of this double layer that allows the link between the electrical properties and the fluid flow properties of the rock to exist. Since pressure differences in the pore fluid pressure can be caused by the passage of seismic waves, there is also a link between the seismic properties of rocks and their electrical properties.



The presentation will begin by reviewing the origin of electro-kinetic and electro-seismic phenomena and the state of the theory that describes these phenomena, both in the DC and the AC regime.

The second part of the presentation will examine briefly some laboratory experiments that have been carried out and others that are in preparation. Such experiments are designed to assess the factors which control the streaming potential coupling coefficient and zeta potential. These factors include the composition, salinity, pH and chemistry of the pore fluid, the mineralogy, porosity, microstructure and saturation state of the rock, the temperature and pressure of the system and, very importantly for electro-seismic applications, the frequency of the fluid flow regime.

In the final part of the presentation some of the applications that are foreseen for these phenomena will be reviewed, including the modelling of fluid flow in volcanoes using surface self-potential measurements, monitoring fluid flow in hydrocarbon reservoirs, and the mechanisms that underlie the triggering of natural earthquakes and the generation of synthetic earthquakes.

Further information may be obtained at the speaker`s website
http://www.ggl.ulaval.ca/personnel/paglover/Home.htm