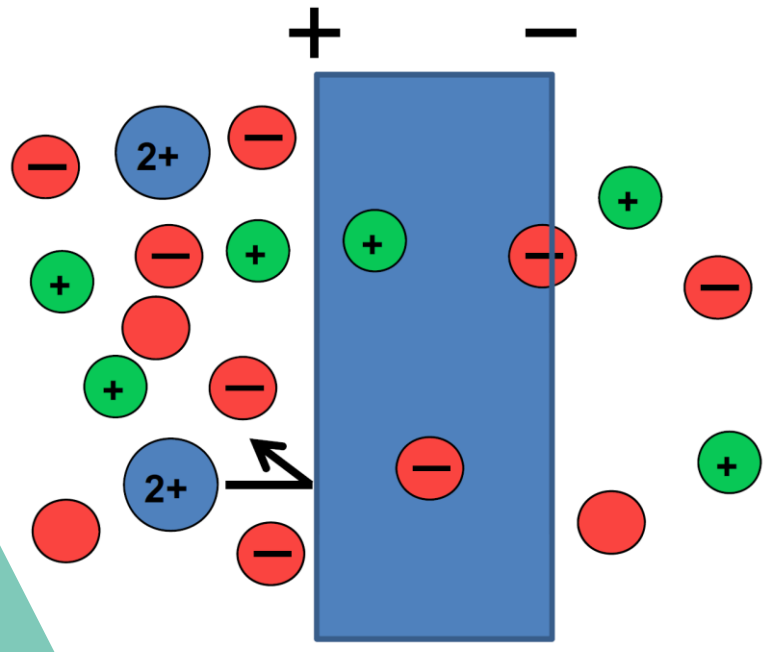

Transport of ionic species in clays: opportunities for electrical measurements

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Politecnico di Torino

Department of Structural, Geotechnical and Building Engineering

Politecnico di Torino

DISEG

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Abstract

Due to permanent fixed charges, many clays behave as partially semipermeable membranes in electrolyte solutions. This leads to strong dependencies of diffusion of trace ions (radionuclides, transition metals, PFAS,...) on the concentration of dominant salts (e.g., NaCl). The trends are opposite for cationic and anionic traces: the diffusion of the former decreases with increasing salt concentration whereas the diffusion of the latter increases. This has been demonstrated experimentally but direct measurements of diffusion are very long and often require classified labs (if radiotracers are used). Measurements of concentration (electric) potential are much shorter but basically provide similar information. Osmotic phenomena may also be important, especially in non-compacted clays like in geotechnical barriers. Direct measurements of osmosis (or osmotic pressure) are also not very fast. Information on the salt reflection coefficient can be obtained from measurements of transient filtration potential (along with some other useful properties). So far, such measurements have been performed only for non-clay materials (some examples will be shown). It would be interesting to try and extend them to clays.

Biosketch

Born and raised in Kyiv, Ukraine. Candidate of Sciences (equivalent to PhD) in Colloid Chemistry, A.V. Dumanskiy Institute of Colloid and Water Chemistry, National Academy of Sciences of Ukraine, Kyiv, 1983. Doctor of Sciences in Physics and Mathematics, Institute of Physical Chemistry of Russian Academy of Sciences, Moscow, 1992. ICREA Research Professor at the Polytechnic University of Catalonia since 2007. Invited researcher/professor at Karl-Franzens Universität, Graz, Austria; École Nationale Supérieure de Chimie et de Physique de Bordeaux (France); École Supérieure Chimie Physique Electronique de Lyon (France); Universität Duisburg - Essen (Germany); Paul-Scherrer-Institute (Switzerland), etc.. Member of Editorial Board of Desalination and Water Treatment (Taylor & Francis UK). Published >150 papers on theoretical and experimental studies of membranes, colloids, porous media and micro-/nano-fluidic systems.

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