International Journal of Geophysics

Special Issue on

Self-Potential in Geological Systems: Recent Advancements and Applications

CALL FOR PAPERS

In many subsurface geological settings, including coastal freshwater and deep saline aquifers, geothermal fields, hydrocarbon reservoirs, CO_2 geological storage sites, and volcanoes, the rocks are at elevated temperature and pressure and are saturated with brines and nonaqueous fluids. Self-potential (SP) is a naturally occurring phenomenon that arises in response to pressure, concentration, temperature, or redox gradients in geological porous media. Recent studies have shown that SP can be useful for the following:

- Monitoring subsurface flows: the possible applications include but are not limited to continuous monitoring of CO_2 motion in suitable geological storage sites, remote detection of saline intrusion into freshwater aquifers, and continuous monitoring of waterfront encroaching onto the production well during hydrocarbon recovery, quantifying vadose zone flow.
- Characterizing rock wettability: the correlation between the SP and the wetting state of rocks can be very useful for accurate prediction of structural and residual trapping of CO_2 in depleted hydrocarbon reservoirs and deep saline aquifers and for improved interpretation of fluid displacement during hydrocarbon production.
- Improved understanding of the physical mechanisms responsible for incremental hydrocarbon recovery during chemical (surfactant, polymer), miscible gas or controlled salinity water injection.
- Seismoelectric exploration: the signal recorded in seismoelectric exploration can be seen as a frequency-dependent SP that is associated with moving seismic waves or when they cross geological interfaces (e.g., lithology, saturation, and pore water chemical contrasts). The interpretation of seismoelectric exploration relies on the correct description of the SP.
- Contaminated area characterization: SP signals measured at the surface of contaminated area results from redox phenomena often called biogeobattery. The SP method has been proven very useful to delineate the extension of contaminated area and to provide a powerful tool for bioremediation monitoring.
- Direct harvesting of the subsurface electrical energy that results from various SP phenomena.

Despite the fact that this area of research has recently gained a lot of interest worldwide, there is still some lack of fundamental understanding of the processes underlying the development of SP under conditions typical for geological systems. Moreover, there exists a very limited amount of laboratory and field data while the published experimental and modelling results are sometimes contradictory and inconsistent.

This special issue seeks high quality submissions, which are devoted to recent research advancements, development, and application of SP for monitoring and characterizing geological flows.

Potential topics include but are not limited to the following:

- Novel micro- and submicro scale fundamental studies including but not limited to molecular dynamics and surface complexation models
- Laboratory-, meso-, and field-scale experiments including but not limited to zeta potential, streaming potential, induced polarization, electrochemical potential, thermoelectric potential complemented by interfacial tension, contact angle, coreflooding, and geophysical filed measurements
- Pore-scale and pore network numerical simulations using combined or stand-alone hydrodynamic, electrodynamic, and reactive transport approaches
- Reservoir-scale simulation studies inclusive of SP modelling
- Field pilot design and applications
- New analytical modelling approaches
- Review articles on the subject

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/ijge/spg/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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