paths have been used to develop a constitutive relationship that describes general compressive loading to failure over the stress range to 0.6 GPa. This relationship is the result of observations indicating that envelopes representing failure and onset of dilatant behavior in this and similar rocks are independent of loading path. This uniqueness results in a relationship among dilatant strain, shear stress, and mean pressure. The experimental data are fitted by an equation that relates dilatant volume strain $\Delta\varepsilon_v$ to mean pressure P and shear stress τ as

$$\Delta\varepsilon_v = \exp\left[\frac{\Delta P}{x(\tau)} - A(\tau)\right] \quad ,$$

where x and A are parameters. The quantity ΔP is the magnitude of pressure release at constant τ necessary to cause the dilatant strain. The dilatant strain may then be added to the compressive strain in the rock to determine total volume strain. This simple relationship allows the amount of dilatant strain to vary with loading path in agreement with experimental observation. It has the added advantage of being able to relate failure to the amount of dilatant strain. Since physical properties such as ultrasonic velocity and electrical resistivity are indicated as being strongly affected by dilatant strain, their behavior is also expected to vary with τ and P similarly to that of $\Delta\varepsilon_v$.

SCHOCK, R. N., and Duba, A., The effect of electrical potential on scale formation in Salton Sea brine, Lawrence Livermore Laboratory, Rept. UCRL-51944 (1975).

Field experiments were carried out at a flowing well in the Salton Sea geothermal field to study the influence of electrical potential on scale deposition. The scale is composed mainly of silicon, iron, copper, silver, and aluminum. Significantly more scale formed on negative than on either positive or neutral electrodes. The scale on the cathode contained up to 1000 times more lead than the scale on the other electrodes. It could also have contained slightly increased amounts of copper. Although the amount of scale on positive and neutral electrodes appeared to be the same, the scale on the positive electrodes was richer in iron and zinc. X-ray powder diffraction reveals the presence of lead as Pb(OH)Cl and of iron as FeOOH. No crystalline silicon forms were detected. Collectively, the results suggest that both iron and lead are present in complex ionic forms in solution.