NUMERICAL SIMULATION COUPLED HYDROMECHANICAL-CHEMICAL OF WEATHERING IN ROCK/SOIL USING ELASTOPLASTIC MODEL

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ABSTRACT - Many types of rocks exposed to the atmosphere are affected by degradation of its characteristics. Degradations from physico-chemical process can compromise the mechanical behavior of porous rock reducing the strenght and stiff of rocks and of the cemented geomaterials when subjected to loading. In recent years, several researchers have sought to understand the effects of weathering on the mechanical behavior of rocks, particularly, observing the changes arising from the rock-fluid interaction as in carbonate rocks, limestone or sandstone. Porous rocks are known to behave differently when they are saturated with different fluids in the pores and to promote additional deformations when the composition of the pore fluid changes. In 2008, Hellmam et al. showed as an effective consequence of chemical reactions in the iteration fluid-rock, deformation of the individual mineral grains and precipitation of material in the pore space, resulting in a concomitant decrease in permeability. In the oil industry the degradation caused by fluid can be seen as a positive point, the acidic solutions are used to stimulate production of oil in the reservoir by dissolving of the rock matrix. Then, when a problem involves multiple physical is necessary to use numerical tools coupled with formulations capable of incorporating the various phenomena. Among the constitutive models capable of explaining the behavior of rock-fluid interaction highlight the BBM (Barcelona Basic Model). This model is based on the suction mechanism and the theory of partially saturated soil mechanics. To consider the chemical effect were incorporated new parameters associated with the bonding of cimented materials, which is affected by plastic degradation induced by chemical weathering, these changes were based on the model and Nova & Castellanza (2004).Now the stress-strain relationship can consider both capillary action and the chemical effect. The objective of this work is do a hydro-chemical-mechanical modelling applying the elasto-plastic model in a sintetic case to verify the mechanical changes of porous rock, as for exemplo, in terms of variation of stresses, strains and porosity, due to the influence of fluid injected the rock / soil. For this purpose we will use the CODE-BRIGHT, "in house" code in finite element, which allows to solve problems hidro thermo-mechanical and chemical.

Key-Words: Modelling hydro-mechanical-chemical, rock-fluid interaction, numerical simulation, finite element.