DEVELOPMENT OF A MECHANISTIC SWELLING-REMOVAL MODEL FOR THE SCANNING FLUID DYNAMIC GAUGE

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ABSTRACT

A mathematical mechanistic swelling-removal approach has been considered for modelling the cleaning process in initially dried egg yolk samples by using the scanning Fluid Dynamic Gauge. The algorithm integrates swelling phenomena with removal mechanisms (shear stress removal and soil dissolution). Swelling phenomena is characterised by applying coupled nonlinear diffusion and long deformation theories. The discretization of the space allows the soil thickness to be divided in theoretical layers. A threshold time is set as the critical value for removal to start. Removal rate is also dependent on the different chemical and physical factors acting: temperature, chemistry concentration (pH, enzyme level), shear stress and frequency of application of shear stress. The model combines all phenomena over time and gives as a response the variation of soil thickness over time. Wash solution concentration profiles in the soil can also be predicted. The model has the potential to apply varying cleaning conditions over time and grow to a more theoretical approach in the future.