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Abstract: Around 1980 bentonite was introduced as sealing materials in groundwater wells. Bentonite was/is considered to be the best solution for that purpose. Still it is up until today widely agreed that part of the contamination (pesticides, hydro carbons and chlorinated solvents) in the groundwater is a result of badly sealed wells (Schmidt, 1999; Jacobsen, 1999; Andreasen, 1999; Lorentzen, 1999; Skovgaard et al., 2001).

When bentonite is dropped down through a borehole it is suppose to settle at the bottom and expand. In practice, a wide range of parameters is involved in that processes, e.g. water chemistry, chemistry of the clay and the physical properties of the clay. The theory behind the interaction of those parameters is not fully theoretically understood.

The aim of this research project is to create a formal theory for each of those processes in order to get an understanding of what happens due to the interaction of different chemical and mechanical processes. This is obtained by developing a set of methods through which each process will be tested individually and in combination with other processes, for a given set of parameters.

The first step in this project will be to identify the key parameter which is believed to have the greatest impact on the processes involved. Secondly, a matrix will be created in which different sealing materials is tested for a given set of parameters. The parameter is supposed to simulate different mechanisms (physical and chemical properties). Finally, on the basis of previous steps, a conceptual model will be created in which different interaction phenomena are included.

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