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Joint studies of water phase transitions in Na-bentonite clay by calorimetric and dielectric methods

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Abstract

The present study consisted of an experimental investigation of phase transitions of soil water contained in moist Na-bentonite clay, using the differential scanning calorimetry (DSC) method, within the temperature range from -40 to 20 °C. Based on the results of DSC analysis, the following components of soil water were found in the frozen bentonite: non-freezing water, unfrozen water and ice. The proposed method of processing the obtained experimental calorimetric data allowed us to determine the temperature dependencies of the content of particular soil water components. Latent heat of fusion was found in two cases, namely: where the ice was transformed into bound or unbound unfrozen soil water. The results of the investigation into phase transitions, obtained via calorimetric measurements, were used to substantiate the method for studying the phase transitions of soil water by dielectric measurements. With this in mind, complex relative permittivity testing was conducted on the same moist Na-bentonite clay, in the temperature range

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