Abstract:

The application of high pressure – low temperature combinations offers various possibilities to accelerate and to control phase changes during food processing. When freezing water containing samples to higher ice polymorphs (ice III, ice V) less damage to structured biomaterials is expected as compared to conventional freezing, mainly because of a decrease in volume during the phase transition (Schlüter, 2004). However, since freezing of water to ice III and ice V required a high degree of supercooling (Evans, 1967) the formation of ice III or ice V during the experiments was not ensured under the process conditions applied in former investigations (Teramoto and Fuchigami, 2000). However, Cheftel et al. (2000) pointed out that it is likely that high pressure ices convert to ice I upon pressure release. Due to this solid-solid phase transition, the expected advantages of freezing to ice III might be neutralised. Edebo and Hedén (1960) reported the disruption of *E. coli* suspended in ice by repeated solid-solid phase transitions between ice I and III, indicating severe structural damage. Consequently in this study an attempt was made to investigate the effect of multiple pressure-supported phase transformations on food related tissues.