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Optical Diagnosis Systems for Measuring Thermofluiddynamicals Phenomena in Liquid Biosystems Under Ultra High Pressure

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In modern bioprocess engineering, novel visualization systems for investigating thermofluiddynamical processes, particularly, phase transition phenomena occurring when liquid systems are pressurized up to 10000 bars are presented. In contradiction to literature, the results found show conclusively that neither the assumption of homogeneity nor of pure diffusive transport in a resting liquid holds. Rather, they clearly demonstrate the heterogeneity of temperature distribution in the liquid phase during pressure induced phase transition of water, even “cold spots” are observed. The existence of this phenomenon is not only a result of thermal diffusion but mainly of convective transport. In fact, during melting, Ice I moves up because its density is lower than that of water. These movements of the ice block forms two counter rotating vortices in the water layer below it. As biosystems could react extremely sensible against mechanical and thermal heterogeneities, published results up today worth to be checked carefully.

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