18g Modeling a Trichlorofluoromethane Hydrate Formation in a W/O Emulsion Submitted to Steady Cooling

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The aim of this work is to study the modelling of the thermal evolution inside an hydrate forming system which is submitted to an imposed steady cooling. The study system is a w/o emulsion where the formulation considers the CCl3F as the hydrate forming molecule dissolved in the oil phase. The hydrate formation occurs in the aqueous phase of the emulsion, i.e. in the dispersed phase. The model equation is based on the resolution of the continuity equation in terms of of a heat balance for the dispersed phase. The crystallization of the CCl3F hydrate occurs at supercooling conditions (Tc < Tf), besides, the heat released during crystallization interferes with the imposed condition of steady decrease of temperature around the system. Thus, the inclusion of the heat source term has to be considered in order to take into account the influence of crystallization. The rate of heat released by crystallization is governed by the probability of nucleation J(T). Previous experimental measurements allowed o derive the corresponding function J(T) of the w/o emulsion. The results provided by the model equation subjected to boundary conditions allow to depict the evolution of temperature in the dispersed phase. The most singular point in the temperature-time curve is the onset time of hydrate crystallization. Three time intervals characterize the evolution of temperature during the steady cooling of the w/o emulsion: 1) steady cooling, 2) hydrate formation with a release of heat, 3) a last interval of cooling