a value of 2.6 W/mK. This calculation uses the CT dissociation front data and Equation (5) to estimate a value of 0.03 for β (a front displacement of 1.7 cm after 840 seconds). While the thermal conductivity value is clearly higher than would be expected for pure thermal conduction, it should be remembered that the value incorporates all heat-transfer processes. Hence, this lumped parameter includes advective processes and kinetic effects as well as potential experimental uncertainty, such as the effects of radial heat transport.

Conclusions

The CT images clearly track the spatial progression of a dissociation front in a sand/hydrate system. By the application of a simple moving-boundary-problem model, the advancement of the dissociation front along with applied temperature boundary conditions have been used to compute an effective thermal conductivity

for the dissociated sand/water ice system. This lumped parameter, which describes the heat-gain processes of the sand/water ice medium, is estimated as 2.6 W/m K. It is considerably higher than expected based purely upon heat conduction alone. One possible explanation for this result is that the effective thermal conductivity incorporates advective and kinetic processes associated with hydrate dissociation. Additionally, if there were significant radial heat transport into the sample, as well as end effects that the model neglects because of our assuming a semi-infinite domain, these model errors would increase the estimated thermal conductivity value. These results demonstrate the value of using remote sensing techniques to track the movement of a hydrate dissociation front for understanding the complex thermodynamics of hydrate/sand systems.

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