

## **Computational Solutions of Fractional Phase Change Problems**

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There has been current interest in studying diffusion processes that involve memory and non-locality. These phenomena can be modeled using fractional calculus tools. A fractional derivative in time, a convolution of previous states of the system, modeling memory and a fractional derivative in space, a convolution over aspace domain, modeling non-locality. In this work we consider how such treatments can be incorporated into models of phase change systems. In particular, we examine the consequences of replacing the time and space derivative in the classic one-phase Stefan melting problem with appropriate fractional derivatives. A number of alternative formations and associated computational schemes for this problem are developed. Connections of the fractional Stefan model to physical situation are illustrated and analytical and numerical predictions are presented.