# On a new wavelet/fictitious domain method for the two-phase Stefan problem

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This paper is devoted to the definition, analysis and implementation of a new numerical method for the approximation of the two-phase Stefan problem. The cascade of elliptic problems obtained after a classical implicit time discretization is first reformulated using a "smooth fictitious domain method" using Lagrange multipliers controling the boundary condition and living on an artificial boundary. Then wavelet approximations are used for the spatial approximation and the approximation of the Lagrange multipliers. A level set approach is used for capturing the front between the two phases.
We show that the smooth fictitious domain implies regularity of the solution on a larger domain and therefore a better convergence rate compared to classical fictitious domain method. Spline wavelet/vaguelet approximation allows to easily control the convergence.
Numerical results are presented in one and two dimension including example with the Gibbes-Thomson boundary condition.

**Références**

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