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The mathematical problems connected with the modeling of the sphalerit disease

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Abstract

In the thesis we study a system of reaction-diffusion equations, describing so called sphalerit disease. In the first part is this system completed with a Gibbs-Thomson law, giving an equation for the mean curvature in terms of chemical potentials. In the framework of BV -functions we construct discrete solutions iteratively by minimizing a suitable energy-functional in each time step. Employing geometric and variational arguments we show an energy estimate which assures compactness of the discrete solutions. Assuming an additional convergence condition we exclude a loss of area in the limit, thus the existence of solutions to the continuous problem can be shown.

By modeling of the sphalerit disease we have to consider entirely different velocities of single diffusion processes and of reaction. In the second part of the thesis we derive the simplified system of equations under the assumption that the fast processes are consider to be instantaneous.