Validation of a thermal crystal growth model including the effect of gas convection

A. Enders-Seidlitz[*], J. Pal, K. Dadzis

Leibniz-Institut für Kristallzüchtung (IKZ), Berlin

[*] E-mail: arved.enders-seidlitz@ikz-berlin.de

The NEMOCRYS project funded by an ERC Starting Grant aims at the development of profoundly validated numerical models for crystal growth processes using the Czochralski (CZ) and Floating Zone (FZ) methods. These growth processes usually involve very high temperatures and have high requirements on the degree of purity, which prevents in-depth measurements in-situ. Therefore, in the NEMOCRYS project, a model system using model materials, e.g, tin instead of silicon, is investigated experimentally and numerically.

The two-dimensional heat transfer simulation is an important tool for the study of crystal growth processes. First attempts of validation of a 2D-CZ numerical model using experimental data revealed a strong influence of convective cooling, which needs to be modeled without introducing a too high complexity. The application of heat transfer coefficients (HTC) is promising, however their computation using empirical formulas seems to be inaccurate. Parameter studies are performed to estimate the influence of the HTC, and different methods for their estimation and validation are discussed.