P15

Thermal analysis for crystal growth beyond 2000°C: Case studies

D. Klimm

Leibniz-Institut für Kristallzüchtung

detlef.klimm@ikz-berlin.de

For some applications such as laser hosts, substrates for epitaxy, or scintillators, crystals with very high melting points beyond 2000°C were identified as prospective materials. Typically data on phase equilibria and redox stability on the materials itself and on constructive parts such as crucibles and thermal insulation are preconditions for successful crystal growth experiments. In this contribution examples will be discussed where DTA measurements and thermodynamic equilibrium calculations helped significantly in the successful crystal growth of such materials:

Rare earth scandates $REScO_3$ are used as substrates for ferroelectric layers where ferroelectric properties can be controlled by "strain engineering". It could be shown by DTA that the scandates of neighbouring RE's form series of solid solutions, and the 2-phase region between liquidus and solidus is narrow. This implies that segregation is negligible during the crystallization of intermediate compositions - allowing this way the „fine tuning“ of lattice parameters.

$CaSc_2O_4$ can be doped with Ce^{3+}, and shows then broad band optical emission in the green spectral range. This effect is technically used *e.g.* in white light emitting diodes, where the primary ultraviolet radiation is converted by Ce^{3+}:$CaSc_2O_4$ ceramic phosphors to white light for illumination purposes. However, cerium is typically 4-valent and co-doping with Na^+ is necessary to stabilize Ce^{3+}. It will be shown that in a suitable atmosphere even Ce^{3+}:$CaSc_2O_4$ single crystals can be grown without co-doping.

[1] Uecker *et al.*, *Acta Physica Polonica A* **124** (2013) 295-300.
[2] Philippen *et al.*, *J. Crystal Growth* **363** (2013) 270-276.