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Computational Analysis of SiC Crystal Growth from Silicon Melt Diluted with Cr, Fe, Co, Ni, Y, Al, La, Ce, Pr, Nd, and Sc. Part 2

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Abstract. In consideration of experience gained in the previous research, an extended two-dimensional analysis of silicon carbide top-seeded solution growth is computationally carried out for 11 binary systems under conditions typical for the real process at temperature and composition varying in a wide range. Along with averaged values of the growth rate, its radial distribution over the seed is investigated for estimating the crystal surface shape. It is found that with the exception of aluminum the addition of other dopants to the silicon melt manifests itself through the growth rate saturation at their certain level above which the growth rate cannot be raised. As it follows from radial distributions obtained, their deviation from a convex parabolic profile decreases with co-solvent content and seed temperature. In this connection, chromium, lanthanides and yttrium can be distinguished as most promising dopants. Additionally, such ternary solutions as Si-Cr-Y and Si-La-Y are predicted to provide both relatively high growth rate and smooth surface of crystal at moderate doping.

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