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Numerical simulation of liquid phase diffusion growth of SiGe single crystals using fixed and dynamic grid techniques: A comparison

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Liquid phase diffusion (LPD) is a solution growth technique that has been used to grow SixGe1-x single crystals. An integrated top level solver has been developed in an open source code OpenFOAM to simulate the initial melting and subsequent solidification process during LPD growth. The initial melting process is modeled using the well-known enthalpy-porosity technique while the solidification is simulated using a model originally developed to model dendritic alloy solidification. Initial melting is modeled in order to compute the shape of the initial growth interface along with temperature and concentration distribution. This information is then used by the solidification solver which in turn predicts the onset of solidification, evolution of the growth interface, and temperature and concentration fields as the solidification proceeds. The results are compared with the previous numerical study conducted using the dynamic grid approach as well as with the earth based experimental results. In the second part of the talk, the simulation of LPD using dynamic grid will be discussed. The implementation has been carried out in commercial code Ansys Fluent software by developing special user defined functions. Finally, a comparison between the two approaches and their relative advantages and disadvantages shall be presented.

Biography

Mandeep Sekhon has completed his PhD in Mechanical Engineering from University of Victoria, BC, Canada and is currently working as a Post-doctoral Researcher at UC, Merced, CA, USA. He did his Master's in Energy studies from Indian Institute of Technology, Delhi. His research interest is in the field of Thermo-Fluids and Energy. He is working in the area of numerical simulation of crystal growth and other material processing technologies.

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