

# Robert Smith

## Senior Research Fellow/Consultant

### **CONTACT DETAILS**

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### **PERSONAL STATEMENT**

Mathematical modeling and numerical computations thermal and mass transfer; computational fluid and gas dynamics; thermal and mechanical stress analysis; transient phase change problems with moving phase boundaries; model analysis, tuning and simulation; finite element and finite difference analysis; computational methods in linear algebra.

### **SKILLS**

Mathematical Modeling  
And Numerical  
Computations Thermal.

### **WORK EXPERIENCE**

#### **Senior Research Fellow/Consultant**

**ABC Corporation - March 1995 - December 2005**

##### *Responsibilities:*

- Designed the uniform algorithm to model crystal growth processes from binary alloys or from doped melt, which can solved classical Stephan problem and the problem of supercooling.
- Simulated the crystallization of binary systems with taking into account chemical reaction equations and influence of electromagnetic forces andor electric current flow on melt convection.
- Developed conservative unconditionally stable finite difference schemes for solution of parabolic partial differential equations with mixed derivatives.
- Significantly improved accuracy and robustness of the software implementing the following programs and methodologies o Tracking of positions of moving boundaries.
- Mapped of physical regions into a set of squares during the simulation time.
- Further refined regularization procedure to provide numerically stable and accurate solution without non-physical oscillations in time and space.
- Validated of approximations, convergence, stability of finite difference schemes.

### **LANGUAGES**

English (Native)  
French (Professional)  
Spanish (Professional)

### **INTERESTS**

Climbing  
Snowboarding  
Cooking  
Reading

### **REFERENCES**

Reference - 1 (Company Name)  
Reference - 2 (Company Name)

#### **Senior Research Fellow**

**Delta Corporation - 1990 - 1995**

##### *Responsibilities:*

- Developed mathematical model, special finite difference approximation and solution algorithms for modeling of transient and quasi stationary crystal growth problems for classical Stephan problem.
- Model consists of a system of parabolic PDEs which are solved in curvilinear domain with unknown moving boundary.
- Equations are approximated on non-orthogonal grid by conservative finite difference scheme.
- To provide stability of numerical solution, special regularization technique has been proposed and applied.
- Developed simulation tool of numerical modeling of crystal growth performed by different technological methods, such as Bridgman and Bridgman-Stockbarger methods, Czochralski crystal growth, traveling heater and floating zone technique.

- The developed software include the following components o Heat and mass transfer equations with melt crystallization o Furnace heating modeling o Radiation heat transfer o Laminar melt flow simulation o Electromagnetic field computation.
- Separate modules of the program provide linearization of nonlinear equations, iterative methods for solution of linearized system of equations, averaging procedure for solving of diffusion problem.

## **Education**

Phd in Computational Mathematics and Cybernetics - (Lomonosov Moscow State University - Moskva)