

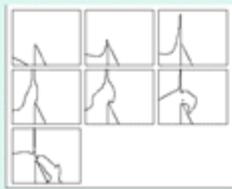
● Solidification Processing

Oak Ridge National Labs

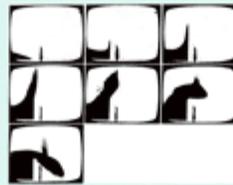
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Research Interests: Advance solidification processing through synergy between property measurement, sensor technology, process monitoring, computational analysis, and experimental research.

Free-surface Flows: The implementation of accurate boundary conditions for velocity and pressure enhance solution algorithms for free-surface flows.



Poor visual agreement for the broken dam problem. Spillage error 31% (RIPPLE).

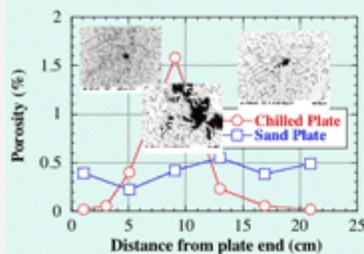


Experimental results (Greenspan and Young, 1978)

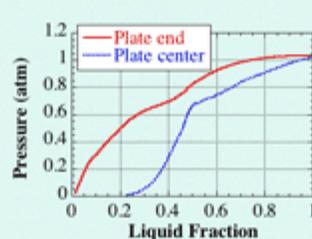


Very good visual agreement. Spillage error 5% (Sabau and Raad; 1995, 1999)

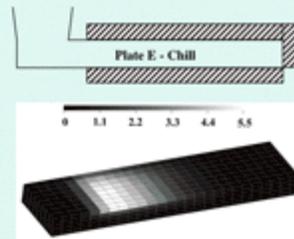
Microporosity Prediction: A model for microporosity prediction during casting solidification was developed based on experimental evidence for pore morphology and thermodynamic considerations for pressure drop.



Shrinkage porosity occurs near the plate center where severe pressure drops are computed.

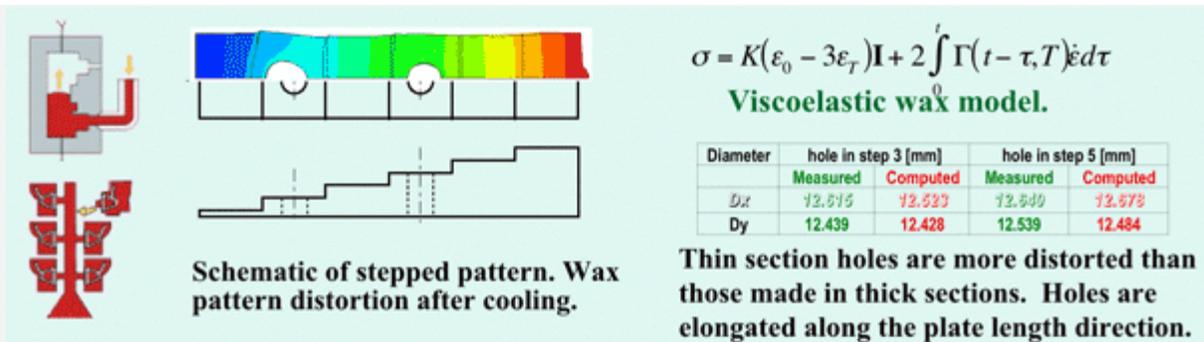


When pressure drops abruptly to low levels, shrinkage porosity evolve.

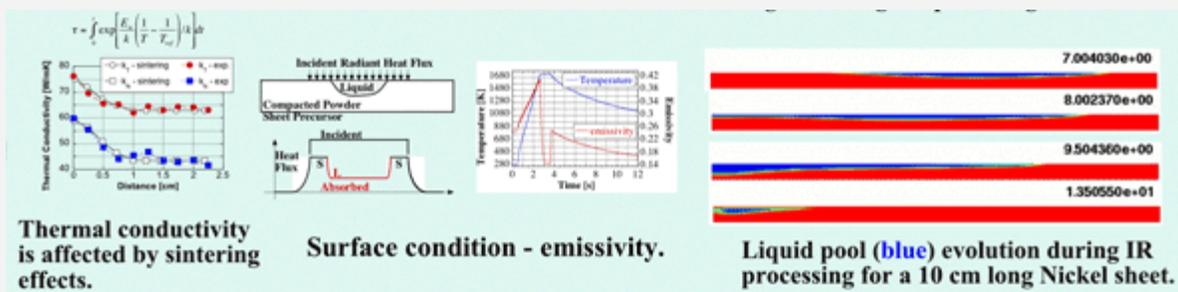


Pore morphology can be predicted (pore irregularity is proportional to ratio of shrinkage/gas porosity).

Investment Casting: Pioneered the measurement of viscoelastic properties of waxes. Distortion of wax patterns can be qualitatively predicted using viscoelastic models.



Infrared Processing: After considering sintering effects and emissivity variation with surface condition in the infrared (IR) process, solidification patterns have been predicted.



Lubricant Application: The cooling effect of lubricant on the die and its insulating effect during casting solidification, are investigated using heat flux sensors.

