Numerical Simulation of a Practical Chemical Vapor Deposition Reactor

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Numerical Simulation was set up to study a rotating vertical impinging chemical vapor deposition (CVD) system for the fabrication of thin films. As the demand for high powered electronics and high-efficiency lighting increases, it is important to look at the quality and characteristics of these thin films, such as the growth rate, microstructure and uniformity. It has been becoming more and more costly for manufacturer to produce these high potent thin films due to the excessive waste of materials and high energy costs. A numerical study can be used to model and optimize the CVD reactor to yield favorable operating conditions. For this study, a simple geometry, consisting of a rotating susceptor and flow guide, is considered. Using only the carrier gases, we can model how the flow enters, spreads over the susceptor and exits the chamber. The study will also show visually how the temperature changes as the carrier gases react to the thermal transport. The surface heat transfer can be related to the deposition rate, which requires inclusion of the reaction kinetics. Further assessment of the system will show the effects of rotation and buoyancy. A three-dimensional model is used due to the rotating susceptor. The results are expected to lead to a better understanding of the basic mechanisms for predicting and optimizing the operating conditions that can be used in an experimental study. Commercially available software is used and the results obtained are discussed in detail.