Numerical investigations of geometric effects on flow and thermal fields in a horizontal CVD reactor

鄭藏勝,蕭名傑
Mechanical Engineering
Engineering
tscheng@chu.edu.tw

Abstract

This paper investigates numerically the effects of tilted angle of the susceptor and the upper wall and of addition of a rib on the three-dimensional (3-D) flow structures and heat transfer characteristics in a model horizontal chemical vapor deposition (CVD) reactor with a circular heated disk which simulates a 12-inch wafer. The Grashof (Gr) and Reynolds (Re) numbers are kept constant at 8.13 × 104 and 100, respectively. Computed flow structures and thermal distributions indicate that as the tilted angle of the susceptor and the upper wall is increased from 0° to 9°, the sizes of transverse (return flow) and longitudinal rolls are reduced and the uniformity of heat flux distribution is improved which would yield better film homogeneity during CVD processing. And the retardation of the growth of thermal boundary layer leads to an increase of the heat flux and hence of the deposition rate. With placing a rib to the upper wall of the reactor, the heat flux on the susceptor is increased but it has a detrimental effect on the uniformity.

Keyword：A1. Computer simulations; A1. Convection; A1. Fluid flow; A3. MOCVD