

**ROTATING SUSCEPTOR SEMICONDUCTOR WAFER PROCESSING
CLUSTER TOOL MODULE USEFUL FOR TUNGSTEN CVD**

A semiconductor wafer processing apparatus 10 or module for a cluster tool is provided with a single wafer rotating susceptor 40 that thins the gas boundary layer to facilitate the transfer of material to or from the wafer 44, in, for example, CVD for blanket or selective deposition of tungsten or titanium nitride, and degassing and annealing processes. Preferably, a downwardly facing showerhead 35 directs a gas mixture from a cooled mixing chamber 30 onto a rapidly rotating wafer 44, for example at from 500 to 1500 RPM, thinning a boundary layer for gas flowing radially outwardly from a stagnation point 198 at the wafer center. Smoothly shaped interior reactor surfaces include baffles 90, 101, 102 and plasma cleaning electrodes 80, 90 to minimize turbulence. Inert gases from within the rotating susceptor 40 minimize turbulence by filling gaps in structure, prevent contamination of moving parts, conduct heat between the susceptor and the wafer 44, and vacuum clamp the wafer to the susceptor 40. A susceptor lip 162 surrounds the wafer 44 and is removable for cleaning, to accommodate different size wafers, and allows change of lip materials to for different processes, such as, one which will resist deposits during selective CVD, or one which scavenges unspent gases in blanket CVD. The lip smooths gas flow, reduces thermal gradients at the wafer edge.

This Sheet Has Been Replaced

