CLAIMS:

1. Wafer processing apparatus comprising:

(a) a processing chamber;

(b) a spindle mounted within the chamber for rotation about an axis extending in upward and downward directions, the spindle having an upper end and a gas passageway having an opening adjacent the upper end of the spindle;

(c) a wafer carrier having a plate-like body defining a central axis and a substantially flat continuous top surface transverse to the central axis, the body further having a plurality of wafer-holding pockets extending downwardly into the body from the top surface and adapted to hold a plurality of wafers so that top surfaces of the wafers are exposed and so that there is a gap between a bottom surface of each wafer and a surface of the body, the upper end of the spindle being adapted to releasably engage the wafer carrier so that the wafer carrier is mechanically connected to the spindle and so that a plurality of gas conduits extending to the wafer-holding pockets of the body of the wafer carrier are in communication with the opening of the gas passageway; and

(d) a rotary connection having an inlet communicating with the gas passageway of the spindle;

(e) a gas inlet element mounted to the chamber adjacent an upper end of the chamber, the gas inlet element being constructed and arranged to direct process gasses downwardly toward the spindle and toward the wafer carrier;

(f) a heater disposed within the chamber for heating a wafer carrier carried mounted on the spindle; and

(g) a control system having a flow controller that is adapted to control the thermal conductivity of a gas

disposed in the gaps between the wafers and the body by controlling at least one of a flow rate or composition of a fill gas through the gas conduits of the wafer carrier~~.~~; wherein the control system is adapted to control the flow rate of the fill gas so that the gas disposed in the gaps between the wafers and the body includes a mixture of the fill gas and the process gasses within a least some portions of the gaps.

~~2. Apparatus as claimed in claim 1 wherein the control system is adapted to control the flow rate of the fill gas so that the gas disposed in the gaps between the wafers and the body includes a mixture of the fill gas and the process gasses within a least some portions of the gaps.~~

~~3~~2. Apparatus as claimed in claim ~~2~~1 wherein the plurality of gas conduits extend to inlet ports located at the centers of the wafer-holding pockets of the body, and wherein the control system is adapted to control the thermal conductivity of the gas disposed in the gaps between the wafers and the body such that the gas at edge regions of each wafer-holding pocket has a different thermal conductivity than the gas at a center of the wafer-holding pocket.

~~4~~3. Apparatus as claimed in claim ~~3~~2 wherein the control system is adapted to control the thermal conductivity of the gas disposed in the gaps between the wafers and the body to counteract the effects of warpage of the wafers held by the wafer carrier.

~~5~~4. Apparatus as claimed in claim 1 wherein each wafer-holding pocket has a plurality of spaced-apart supports extending upwardly from the surface of the body and adapted to hold a corresponding one of the wafers, and wherein the control system is adapted to control the flow rate of the fill gas so that the wafers do not lift off of the supports.

~~6~~5. Apparatus as claimed in claim 1 further comprising (h) a temperature monitoring apparatus arranged to record surface temperatures of the wafers, wherein the control system is adapted to control at least one of the flow rate or composition of the fill gas in response to temperatures recorded by the temperature monitoring apparatus.

~~7~~6. Apparatus as claimed in claim 1 wherein the heater is disposed below the wafer carrier and is arranged to heat the bottom surface of the wafer carrier.

~~8~~7. Apparatus as claimed in claim 1 further comprising:

(h) a motor drive for rotating the spindle about the axis.

~~9~~8. Apparatus as claimed in claim 1 wherein the upper end of the spindle includes a tapered section having upper and lower end and the opening of the gas passageway is disposed above the lower end of the tapered section.

~~10~~9. A wafer carrier comprising:

(a) a unitary plate-like body defining a central axis and a substantially flat continuous top surface transverse to the central axis, the body further having a plurality of wafer-holding pockets extending downwardly into the body from the top surface and adapted to hold a plurality of wafers so that top surfaces of the wafers are exposed and so that there is a gap between a bottom surface of each wafer and a surface of the body, each wafer-holding pocket having a plurality of spaced-apart supports extending upwardly from the surface of the body and adapted to hold a corresponding one of the wafers,

(b) structure defining one or more gas conduits extending to inlet ports located at the centers of the wafer-holding pockets of the body so that a fill gas supplied to the

gas conduits will be directed into the gaps between the bottom surface of the wafers and the body; and

(c) a fitting at the central axis of the body, the fitting being adapted to releasably engage a spindle of a wafer processing apparatus and hold the wafer carrier on the spindle so that the one or more gas conduits are in communication with one or more gas passageways of the spindle.

~~11~~10. A wafer carrier as claimed in claim ~~10~~9 wherein the fitting defines a recess open in the downward direction for receiving the spindle and the one or more gas conduits communicate with the recess.

~~12~~11. A wafer carrier as claimed in claim ~~11~~10 wherein the recess is tapered in the upward direction.

~~13~~12. A wafer carrier as claimed in claim ~~10~~9 wherein the conduits communicate with the pockets.

~~14~~13. A wafer carrier as claimed in claim ~~13~~12 wherein the each pocket includes a floor surface recessed below top surface, a peripheral wall extending upwardly from the floor surface to the top surface and a plurality of supports extending above the floor surface but below the top surface for supporting a wafer above the floor surface.

~~15~~14. A wafer carrier as claimed in claim ~~14~~13 wherein each floor surface has a port disposed adjacent the center of the pocket and the conduits communicate with the pockets through the ports.