Abstract

A method for cleaning a semiconductor structure using vapor phase condensation with a thermally vaporized cleaning agent, a hydrocarbon vaporized by pressure variation, or a combination of the two. In the thermally vaporized cleaning agent process, a semiconductor structure is lowered into a vapor blanket in a thermal gradient cleaning chamber at atmospheric pressure formed by heating a liquid cleaning agent below the vapor blanket and cooling the liquid cleaning agent above the vapor blanket causing it to condense and return to the bottom of the thermal gradient cleaning chamber. The semiconductor structure is then raised above the vapor blanket and the cleaning agent condenses on all of the surfaces of the semiconductor structure removing contaminants and is returned to the bottom of the chamber by gravity. In the pressurized hydrocarbon process, a semiconductor structure is placed into a variable pressure cleaning chamber, having a piston which changes the pressure by reducing or increasing the volume of the chamber. The semiconductor structure first exposed to the hydrocarbon in vapor phase, then the piston is lowered to condense the hydrocarbon. A semiconductor structure can be cleaned by either or both of these processes by repetitive vaporization/condensation cycles.

Fig 1