Early 1970s
Using low-pressure CVD to form films of polycrystalline silicon, oxide, and silicon nitride
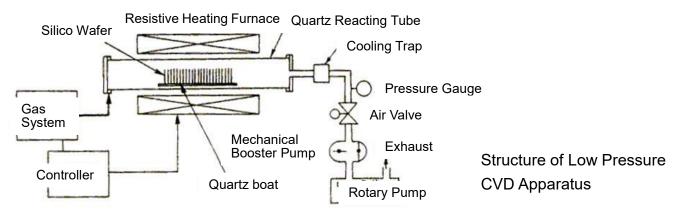## ~ Process Technology ~

Thermal CVD (Chemical Vapor Deposition) is a method in which raw material gases containing components of a thin film to be formed are supplied onto a wafer, heated in a reaction tube made of quartz or the like, and a thin film is formed by chemical reaction on the wafer surface or in the gas phase. In the atmospheric pressure CVD apparatus which had been used until around the mid-1970s, the wafers were flatly placed on a hot plate, and the gases had to be supplied uniformly onto the wafers, and the numbers of wafers was limited, resulting in low productivity.

In the early 1970s, a low-pressure CVD apparatus with significantly improved productivity was developed. It is a method in which wafers are vertically placed against the low-pressure gas flow in the horizontal diffusion furnace. The low-pressure CVD is also called LPCVD, and since the film is formed at a low pressure of 1/100 to 1/10000 of the atmospheric pressure, the gas molecule collision with each other decreases, and the concentration of reacting gases become uniform over a wide range, and the active gas is evenly introduced into the gap between the vertically placed wafers, resulting in the uniform growth of the film.

It was initially established as a method of forming poly Si and silicon nitride films (Si_3N_4), and it was later applied to oxide (SiO_2) film formation, too. The silicon gate MOS transistor technology was put into practical use by the development of this Poly Si film forming technology, and the Si_3N_4 film was applied to LOCOS (Local Oxidation of Silicon), both of which greatly contributed to the advancement of high-density and high-integration MOSLSIs.

In terms of manufacturing share of LPCVD equipment at the time of 2001, Tokyo Electron was the No.1, Hitachi Kokusai Electric was in the 2nd place, and total share between these two companies was 70%.

Structure of Low Pressure CVD Apparatus