

Rapid Thermal Processing (RTP)

In Rapid Thermal Processing (RTP) of semiconductor wafers, different metal compounds, such as tungsten, cobalt, platinum, aluminium or gallium, can be deposited onto the wafer by essentially baking the wafer in the presence of different gases. A semiconductor wafer is placed in front of high powered heat lamps bringing the temperature 400°C to 1200°C. The deposition of these different compounds will make the semiconductor wafer perform different operations. The gases used include, but are not limited to, argon (Ar), hydrogen (H₂), oxygen (O₂), nitrogen (N₂), nitrous oxide (N₂O), hydrochloric acid (HCl) and ammonia (NH₃).

Oxygen analysers are used to detect trace amounts of oxygen within these gas components. The presence of oxygen can cause the metal deposits to oxidise forming a new compound with poor conductive properties. Yet in some applications, high concentrations of oxygen are used to increase the oxidation process because the metal oxide is a better conductor. Oxygen analysis is performed in two areas. First, oxygen analysis is sometimes performed on the gas supply before entering the RTP apparatus where ppb to low ppm levels of oxygen are needed. Secondly, it is essential to analyse oxygen inside the wafer processing area. This is commonly done by testing the exhaust gas from the RTP equipment. The oxygen levels for this application are generally in the 10-100ppm region.

In the first application, monitoring the gas supply lines, the 176 or the 276 is recommended. Generally, this is a continuous monitoring at low levels and response time is not a factor. It should be noted that some gases are not suitable for these instruments, hydrochloric acid for example. Response time in the second application is vital. The faster the response time, the better. Here, the Model 900 is an excellent choice. Again, gases not suitable for this instrument include hydrogen and hydrochloric acid.

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