

THE ROI VALUE OF IRGAS™ ANALYZERS TO SEMI WAFER PRODUCTION

CIC Photonics, Inc. has been providing solutions to the semiconductor industry since the year 2000. In these past several years, we have gained significant knowledge and a proven track record in assisting fab plants around the world in reducing and preventing the loss of production wafers due to impurity gas contaminations.

The real culprit for contamination of wafers and their semiconductor properties is oxygen atom defects, which get introduced when the wafer is exposed to O-atom-containing impurity species like H₂O, O₂, CO, CO₂, NO_x, SO_x, etc. With moisture abundant almost everywhere, it is the predominant culprit in most wafer production and treatment operations, including pretreatments, cleaning, etching, vapor deposition, and epitaxial treatment.

When moisture and the other O-atom species contaminate a wafer, that wafer is lost to use, including all the other wafers in a process line that are similarly exposed. Those losses in value can easily amount to \$10,000 to \$100,000 per incident. If multiple process tools are simultaneously exposed to contaminations, the economic loss can be enormous.

The best way to prevent or minimize these potential losses is to place a high performance gas analyzer online with the process tool for real-time in-situ monitoring and measurement of the quality of the process gases, both in and out of the tool. A distinct advantage of the IRGAS FTIR Gas Analyzer is that it can detect and measure almost all* gaseous species simultaneously and at multiple locations in the process line. The associated SPGAS™ and SpectraStream™ software enable fast response times (seconds) for the detection of significant changes in the impurity species, which might occur due to changes from supply gas sources, gas line leakages, and operator errors. *Note: FTIR can not detect monatomic species like Ar or homopolar diatomic molecules like O₂, Br₂, etc.

The electronic specialty gas producers have perfected their gas production and purification procedures to the point that they can certify that total impurity content is below 1 ppm, and for some individual species below 300 ppb; but moisture content is often the exception, since there are multiple sources of it besides the semi gas cylinders.

Ten years ago, fab plants were satisfied with moisture impurities in semi gases being 500 ppb or better; but now they are specifying less than 25 ppb and sometimes even single digit purities. The latter can only really be accomplished by placing moisture purifiers inline with the supply gas cylinders or at the process tool. However, these purifiers have limited life-times dependent upon the total volume of gas flowing through them; so they have to be replaced on a regular basis.

An IRGAS Gas Analyzer also serves the purpose of detecting when a purifier needs to be replaced, which we have demonstrated with a major semi equipment manufacturer.

Therefore, the “ROI Value” of an IRGAS FTIR Gas Analyzer, which costs \$85,000 to \$125,000, is readily achievable often the first time an O-atom defect incident occurs due to moisture contamination of a supply gas or degradation of a supply line.

We invite you to visit our web site www.irgas.com and its “Application Notes” for examples of our successful services for the semiconductor industry; also see especially the “EPITORR™.”