DEVELOPMENT OF ON-LINE INSTRUMENTS FOR MONITORING OF METHANE AND NMTHC AT PPB AND PPM LEVELS WITHOUT MATRIX EFFECTS

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Monitoring of methane and Non-Methane Total Hydrocarbons (NMTHC) is an important tool for process monitoring. In the microelectronics industry, the silicon substrates (wafers) are stored in containers, named FOUP (Front Opening Unified Pod) made in polymers (PC, PEEK, COP, PEI). Such materials are able to adsorb the Volatile Molecular Contaminants (VMC) and subsequently outgas these ones in presence of wafers, leading then to defective wafers. Depending on the process, the composition of the gas in the FOUP can be very different. The amount of VMC can vary from ppb to tens of ppm while the matrix gas can be air, N2 or Argon. Most of the instruments which measure NMTHC are very sensitive to the matrix composition. Therefore, there is a need for an instrument which can measure methane and NMTHC without matrix effects. Ideally, the cycle time of the instrument should be less than 3 minutes and sensitive at ppb level. For this study, a Gas Chromatograph (GC) with two analytical columns and a Flame Ionization Detector (FID) is used to achieve the absolute separation of methane, NMTHC and matrix gases. The low detection limit, linearity and stability of the system are evaluated from ppb to ppm using different types of VOC and matrix gases. The results show that the special configuration of the analytical system allows the complete separation of the matrix gases from methane and NMTHC. Therefore the instrument does not need specific calibrations for different matrix. The instrument is very linear and sensitive from low ppb up to 20 ppm with the same amplification.

Keywords: Gas Chromatography, Non-Methane Total Hydrocarbons, Volatile Organic Compounds, On-line Monitoring