

RGA Factors Affecting Partial Pressure Measurements at UHV/XHV

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ABSTRACT

Measurements of partial pressures at low UHV and XHV pressure regimes by residual gas analyzer (RGA) pushes the limits of detection for many RGAs. Improved RGAs for the future will need to address many factors that affect detection limit. Electron impact ionization remains a preferred method for ion production. Electron emissions of 1-2 mA are routinely possible (and needed) which greatly exceeds emission from carbon nanotube (CNT) emitters with lower outgassing. Minimizing the thermal-induced outgassing of the source region can be accomplished by filament material selection and design to minimize filament power. Sensitivity begins with total ion production. The ionization region needs an open grid volume to enable multiple passes of electrons through the region. Ion extraction and transmission through the mass analyzer needs to be optimized to give flat-top peaks as an indication of maximum transmission to maintain sensitivity. Ion currents in the XHV regime are small and even with an electron multiplier to produce an electron current with (-)1000X ion current, the noise level of electrometers defines detection limits. These ion currents are low enough that ion counting is a practical improvement. The radiation field at the electronics is an issue for some installations such that umbilical cabling has been used to place electronics in a lower radiation field. There is an associated degradation of ion detection from cable length and flexing. The possibility of mounting (with shielding) the electrometer or pulse counting electronics at the RGA feedthrough with other electronics remote on an umbilical will be presented for discussion.

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