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In Situ Effective Pumping Speed Measurements as a Tool for Non-Evaporable Getter Activation and Saturation Monitoring

We have developed method of in situ effective pumping speed measurements based on injecting of small amount of gas into a volume of a vacuum chamber and subsequent recording of pressure burst decay time dynamics using Residual Gas Analyzer (RGA). Within the certain range, the pressure burst caused by injected gas will drop exponentially in time and exponential coefficient of such pressure decay is proportional to total effective pumping speed of all vacuum pumps acting on vacuum chamber volume. Thus, effective pumping speed can be extracted from the dependence of injected gas specie pressure vs time recorded by RGA. Non-Evaporable Getters (NEGs) are widely used for multiple ultra and extremely high vacuum devices and applications over the last several decades. Moreover, possible NEG applications were recently expanded into vacuum devices with relatively high-pressure levels, up to $10E-7$ Torr, by invention of, so called, high capacity ZAO NEG which can be operated at elevated temperatures. The intrinsic property of all NEG-based vacuum pumps is the reduction of their pumping speed, called NEG saturation, after certain period of operation. Typical time interval for such process can span from about a month and up to a few years depending on NEG type, vacuum level of NEG pump operation, and residual gas content. After that, NEG pump will require to undergo re-activation cycle to restore pumping speed back close to initial value. For many applications it is almost impossible to realize what is the current pumping speed of NEG pump is and when the pump should be re-activated. Developed method of in situ effective pumping speed measurements can be used as a tool for NEG-based pumps activation and saturation monitoring. Application of such approach to monitor pumping status of NEG pumps was utilized at Extended EBIS which is recently developed for Relativistic Heavy Ion Collider (RHIC) and future Electron Ion Collider (EIC). The results obtained are presented and discussed.

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Yes

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