HYDROGEN IN VACUUM SYSTEMS; AN OVERVIEW

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Abstract

Hydrogen is the predominant residual gas in metal vacuum systems at low pressures (i.e. in the utrahigh [uhv] and extreme high vacuum [xhv] ranges) and the reduction in the hydrogen outgassing rate is the most challenging problem in achieving xhv. Our understanding of the diffusion and adsorption/desorption processes involved in the outgassing of hydrogen from metals has much improved in recent years and has led to better methods for reducing the outgassing rates of hydrogen from metals such as stainless steel and aluminum alloys. This overview examines some recent advances in our understanding of the effects of hydrogen in vacuum systems; these include a) the adsorption/desorption/diffusion equilibrium at the vacuum-metal interface, b) the effects of multiple energy states of H atoms in the bulk metal, c) the physical adsorption of hydrogen on surfaces at cryogenic temperatures and d) the effects of electron stimulated desorption of hydrogen on pressure measurements by ionization gauges and residual gas analyzers.