

Turbopump Preselection of Analytes Based on Molecular Weight

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We have been exploring the exploitation of the mass dependence of turbopump efficiency for preconcentration of analyte species for chemical analysis. The eventual goal is to develop a concentrator front end for a portable mass spectrometer that will increase the sensitivity for species of particular interest to potential sponsors. These analytes include CW agents, explosives, toxic industrial chemicals, noble gases, and some biological molecules. It is well known that turbomolecular pumps are in general less effective for light species such as H₂ and He than for the more massive atmospheric constituents. A theoretical analysis of turbopump behavior shows that the compression ratio depends on the ratio of blade velocity to the thermal velocity of the atoms or molecules being pumped. The velocity ratio is proportional to the square root of the mass, thus heavier species are pumped more effectively. In this talk, we will show how a turbopump can be used to discard heavy matrix species from a mixture of gases and will discuss methods of performing the inverse process.