Vapour Pressure Determination by a Combination of Static and Chromatographic Techniques

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Vapor pressure plays a critically important role in a number of applications ranging from technology to ecology. Though there are a vast number of compounds with well established vapour pressures, measurements are still needed, especially in the low pressure region (below 1 kPa). The static method is a well established technique for vapor pressure measurement. On the other hand, the need for very pure and carefully degassed samples makes the method laborious, costly and slow. Methods based on determination of gas-chromatographic (GC) retention times are fast and require only a very small amount of the compound. In addition, compared to most other methods, sample purity is of little concern. In practice, a series of isothermal GC runs is made at different temperatures and the relative retention time (or Kovats retention index) of the test compound to a standard is measured at each temperature. The test compound vapor pressure is determined from changes in the relative retention with temperature and the known vapor pressure of the standard. Main factors limiting the use of the GC method include frequently encountered non-similarity of activity coefficients of the test and standard compounds (e.g. in cases when *n*-alkanes are used as standards for polar test compounds), and unavailability of accurate vapor pressure data of standards over a temperature range relevant to GC measurements. We measured vapor pressures of standards by the accurate static method and utilized them as input data for calculating the GC-based vapor pressure estimates of structurally similar test compounds. This should enable both the determination of new vapor pressures of polar model compounds and the extension of the temperature range of vapor pressure data into regions not covered by the static technique. The first results of these efforts to combine the static and GC techniques are presented.