# Vapor Pressure Measurements on Cannabinoids and Cannabis-Associated Terpenes to Support Cannabis Breathalyzer Development


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Efforts to develop a cannabis breathalyzer are hindered by the lack of vapor pressure ($p^{sat}$) data for cannabinoids and cannabis-associated terpenes. Such $p^{sat}$ data are needed because they define the upper limit of concentration in the vapor phase of exhaled breath. However, these compounds tend to have limited thermal stability, which is problematic for low uncertainty measurements. To address this issue, we have developed a new type of gas-saturation (a.k.a. transpiration) measurement method that is optimized for the rapid collection of vapor samples. This method, which we call dynamic vapor microextraction (DVME), has four key features: (1) the use of a miniature vapor-equilibration vessel to minimize temperature gradients and internal volume, (2) the use of a capillary vapor trap to minimize internal volume, (3) the use of helium carrier gas to minimize nonideal mixture behavior, and (4) the direct measurement of pressure inside the vapor-equilibration vessel to account for overpressure caused by viscous flow. The performance of DVME has been validated with $p^{sat}$ measurements on the reference compound *n*-eicosane ($C_{20}H_{42}$). The standard uncertainty in the resulting data was about $0.02{\cdot}p^{sat}$, which is the state of the art for measurements in the pressure range studied. Further validation involved measurements on the cannabis-associated terpene linalool, for which high-quality $p^{sat}$ data had been previously published. The standard uncertainty for the DVME measurements on linalool was somewhat higher (about $0.04{\cdot}p^{sat}$) for reasons associated with the sample compound. Nevertheless, excellent agreement with literature data was obtained. Following these validation studies, we measured $p^{sat}$ for the cannabinoids d9-tetrahydrocannabinol (THC), cannabidiol (CBD), and cannabinol (CBN) over the temperature range 364 K to 424 K. These measurements, along with the associated uncertainty analysis and control experiments, will be presented.