Vapor Pressure Measurements of Cannabinoids

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The quest for a reliable means to detect cannabis intoxication with a breathalyzer is ongoing. To design such a device, it is important to understand the fundamental thermodynamics of the compounds of interest. The vapor pressures of two important cannabinoids, cannabidiol (CBD) and tetrahydrocannabinol (THC), are presented. Vapor pressure is the very first thing needed to begin a rudimentary equation of state (EOS). An EOS is necessary to provide an avenue for predicting thermophysical properties that are important for designing and engineering a specialized device such as a cannabis breathalyzer. Vapor pressure measurements can be used to predict the normal boiling temperature (NBT, temperature that the fluid boils near 0.1 MPa), which can then be used to predict the critical constants (critical temperature, critical pressure and critical volume). The uncertainty of calculations from these models is of course dependent on the uncertainty of the input data; more data and lower uncertainty is always desirable. For cannabinoids, there is no available data, thus these will be the first available measurements for the field. Measuring the vapor phase of these compounds is challenging, because they have high molecular masses (and low vapor pressures) and are reactive in the presence of oxygen (unstable). An ultra-sensitive, quantitative, trace dynamic headspace analysis sampling called porous layered open tubular-cryoadsorption (PLOT-cryo) was used to measure vapor pressures of these compounds. The linear relationship of the mass collected (normalized by the volume of sweep gas used to collect the mass) as a function of inverse collection temperature is an indication of the thermodynamic consistency and predictive capabilities of the methodology employed here.