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The vapor pressures of dicarboxylic acids reconsidered: No indication for an even-odd alternation of vapor pressures.

V. Soonsin, A. A. Zardini, U. K. Krieger and C. Marcolli
Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland
(ulrich.krieger@env.ethz.ch)

Dicarboxylic acids are common water soluble organic components of atmospheric aerosols. To understand their partitioning between gas and particle phase requires the knowledge of their vapor pressures. Recently, Bilde et al. [2003] used a TDMA technique to measure the vapor pressures of the C3 to C9 dicarboxylic acids and found their vapor pressures to alternate strongly with the parity of the carbon atoms, with the odd acids exhibiting up to one order of magnitude higher vapor pressures compared to those of the even acids with comparable chain length.

Using single levitated aerosol particles and Mie resonance spectroscopy [Zardini et al., 2006] we measured evaporation rates of C2 to C5 dicarboxylic acid particles in different physical states, namely as a solid, as a saturated aqueous solution and as a supercooled melt. We found that the vapor pressures of the supercooled melt are about one order of magnitude higher than those of the solids and the saturated solutions, which agree with each other within experimental error. Also, our data agree with those of Bilde et al. [2003] within experimental error, if we assume that the odd acids did not effloresce in their experimental setup, while the even acids did. This interpretation is also consistent with the measured efflorescence relative humidities of the dicarboxylic acids. Thus, we conclude that there is no significant even-odd alternation of the vapor pressures of dicarboxylic acids in totally liquid or totally solid aerosol particles.

References: M. Bilde et al., Environ. Sci. Technol., 37, 1371 (2003). A. A. Zardini et al., Opt. Express, 14, 6951 (2006).