



The relative ionization efficiency of water in an AMS

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We present the determination of the relative ionization efficiency of water (RIEH₂O) in an AMS. Among others, unknown calibration factors hindered the quantitative measurement of water with the AMS so far. Three oxalate salts, ammonium oxalate ((NH₄)₂C₂O₄ x 1 H₂O), potassium oxalate (K₂C₂O₄ x 1 H₂O), and sodium oxalate (Na₂C₂O₄), were used. These substances were chosen since their crystal water content does not evaporate within the AMS inlet system and the oxalate ion shows a simple fragmentation pattern in the mass spectrometer. The analysis shows that the RIEH₂O in an AMS is 2. Application of the new RIEH₂O to oxalic acid and high resolution mass spectrometric analysis revealed a significant ammonium contamination of the solid and its solutions as well as a water deficit within the molecular structure of the oxalic acid aerosol particles. Implications of this contamination for laboratory investigations studying the hygroscopic and CCN properties of oxalic acid are discussed. As examples hygroscopic growth measurements of the oxalates were performed with a Hygroscopic Tandem Differential Mobility Analyzer (HTDMA) in the range of 2 % to 95 % relative humidity. While potassium oxalate and sodium oxalate show the expected behavior of slightly soluble inorganic salts, ammonium oxalate and oxalic acid exhibited some irregularities at the theoretical points of efflorescence.