A Liquid Chromatography System for Measurement of Organic Acids in Precipitation

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Abstract

An ion chromatographic system has been developed for routine measurement of carboxylic acids with carbon numbers up to C₈ in precipitation samples. The system combines on-line sample pre-concentration on a low-capacity anion exchange resin with separation by ion exclusion and subsequent detection by UV absorption. Detection limits (peak-to-noise ratio 10:1) of less than 0.4μmolL⁻¹ are obtained for formic acid and acetic acid. Mineral acids such as sulfuric, nitric and hydrochloric acid, which usually represent the main anions in continental precipitation over the northern hemisphere, do not interfere, since they elute as one peak in the beginning of the chromatogram. The chromatographic system has been tested for overlapping peaks with a variety of C₁-C₈ carboxylic acids, both saturated and unsaturated, substituted and unsubstituted, and with phenol and benzene. Not all organic anions are fully separated: oxalate, maleate, and the anions of various multifunctional organic acids up to tartrate and probably citrate are hidden under the large peak of the strong mineral acids; several other peaks were found to overlap by more than 50%. In many cases, this may not be important, since measurements by other groups and models of tropospheric photochemistry have shown that there are certain acids such as formic and acetic acids which generally predominate in the atmospheric mixture of acidic organic compounds.