

A Non-destructive FTIR Method for the Determination of Ammonium and Sulfate in Urban PM_{2.5} Samples

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Abstract: Traditionally, the atmospheric particle composition is analyzed using destructive methods. In general, the destructive methods lead to the destruction of the samples, higher cost of the analysis and larger analysis time. In view of aforesaid, in current work, we present a method for the non-destructive analysis of atmospheric particles using open path Fourier transform infrared spectroscopy (OP-FTIR). The developed method has been used for the measurement of ammonium and sulfate in atmospheric particles without destroying the samples. Here, we targeted the said species because of their relative importance for air pollution episode formation. Particulate sulfate plays a major role in formation of haze. However; particulate acidity is an important factor in this process, which is governed by particulate ammonium concentration. Therefore, both SO₄²⁻ and NH₄⁺ are important as far as atmospheric chemistry of haze formation is concerned. In the present study, the qualitative and quantitative estimation of ammonium and sulfate ions in PM_{2.5} (particulate matter with aerodynamic diameter less than 2.5 μm) was carried out using OP-FTIR with the developed method. The seasonal average concentration of NH₄⁺ and SO₄²⁻ were measured to be 12.00 ± 5.80, 31.71 ± 12.71 μg/m³ respectively for winters, 3.00 ± 0.85 and 8.00 ± 2.28 μg/m³ respectively for summers and 2.60 ± 1.90 and 7.00 ± 5.21 μg/m³ respectively for monsoon season. The observed results are found to be in good agreement with that of other studies using destructive methods.

Keywords: PM_{2.5}; Chemical characterization; FTIR; Non-destructive