Environmetric Interpretation of Different Size Fractioned Aerosol Monitoring Data

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The rapid development of the research and study in the field of nanomaterials and nanotechnologies still lacks the answer of the question about the possible environmental hazards which could happen when the scale of nanomaterials production becomes massive. Although there are already series of publications concerning the problem, no detailed studies or scenarios are available for real assessment of the environmental quality in the moment of turning nanotechnologies into a routine industrial activity.

The main goal of the present study is to perform classification and modeling of aerosol monitoring data by the use of environmetrics methods in order to better understand the specificity of the nanoparticles as air pollutants as well as their seasonal behavior. It is well known that the air-borne particles are the major atmospheric pollutant and small-sized aerosols are serious danger for human health. That is why in the study the collection of aerosols was performed by the use of cascade impactor in order to separate the dust into 6 different size fractions – from 0.01 to 25 μm. The different samples were analyzed for the content of 16 chemical parameters (major ions, carbon content and heavy metals). The sampling sites were located in an Alpine region of Austria near to the Slovenian border. Advanced environmetric methods such as N-way Principal Components Analysis, PARAFAC and Self-Organizing Maps (SOM) were involved in the classification and modeling study.

The study has indicated that there is a specific relationship between each aerosol fraction and the chemical content, season of sampling and sampling location. None of these relationships could be reliably interpreted without application of environmetrics which turns to be one of the major metrics for risk assessment and sustainable development.