

Recipients of Young Investigator Research Grants

2018

Dr. Evgeny Shirshin, Moscow State University, Faculty of Physics, Russia

“Development of the theory of humic substances optical properties formation”

Abstract: Optical methods are routinely used to characterize structural changes in HS in a wide range of applications including marine geochemistry, hydrology, soil science etc. The main advantage of this technique is its simplicity, cost, time of analysis and relative sensitivity. Based on the results of phenomenological studies, the so-called optical descriptors, which are parameters extracted from HS absorption and fluorescence spectra (e.g. SUVA and E_4/E_6), have been introduced to assess the origin of HS and its composition (e.g. the humification degree). However, there is no theoretical model, which describes the mechanism of HS optical properties formation and the reasons, which underlay similarity in the behavior of HS absorption and emission spectra regardless of their dramatic structural diversity. In this project, we propose the development of such model based on the results of investigation of heterogeneous set of HS, characterized by different origin, by the advanced laser spectroscopy techniques. This will help in developing new optical descriptors of the HS structure and to reach a new level of understanding of molecular organization of HS, including the interaction of between molecular components in the ensemble.

Jiri Smilek, Brno University of Technology, Faculty of Chemistry, Materials Research Centre, Czech Republic

“Interaction of different (methylated) humic acids with organic ionic compounds”

Abstract: Project proposal is aimed on complex in-depth research on the interaction between humic acids and ionic compounds (e.g. organic dyes, surfactants or heavy metal ions). To fulfil this complex task and to be able to describe the way of formation of these interactions, the reactivity of native HA will be compared with their selectively modified equivalents (selectively blocked carboxylic functional groups by methylation). The formation of the interactions between different (original and modified) humic acids and ionic compounds will be studied either by transport experiments (diffusion, dialysis) as well as by advanced instrumental methods such as Fluorescence Correlation Spectroscopy, light scattering techniques and differential UV-VIS spectroscopy. The most important output from the project can be found in complex description of mutual interconnection of transport phenomena and formation of interactions between HA and ionic species in respect to basic humic acids structural parameters (e.g. content of free carboxylic functional groups, molecular weight, particle size, acidity).