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Editors

Functions of Natural Organic Matter in Changing Environment

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Preface

The changing environment leading to environmental issues is challenging the world for its sustainability. The theme of the 16th Meeting of the International Humic Substances Society (IHSS 16) is of special significance for understanding how and to what extent the various environmental processes of soil nutrients and pollutants at micro- and macro-levels are affected by humic substances (HS), natural organic matter (NOM), naturally occurring and engineered nanoparticles, and biochar. Further advance on the frontiers of knowledge on this subject matter requires scientists to cross disciplines and scales to integrate understanding of processes in the changing environment, ranging in scale from the formation, structure and characteristics of HS and NOM, environmental mineral-organism-humus-water-air interactions, to the impact on the globe and humankind. These fundamental interactive processes have enormous impacts on both terrestrial and aquatic ecosystem biodiversity, health, productivity and services, and on human welfare as a whole.

Carbon is a major component of HS, NOM, and soils. Globally, the mass of soil organic carbon is more than that of carbon in living matter and in the atmosphere combined. However, the CO_2 emission from the soil to the atmosphere is the primary mechanism of soil carbon loss. Agricultural practices and land use patterns contribute substantially to the total anthropogenic CO_2 emission. Soil organo-mineral-microbe interactions affect carbon turnover and sequestration. Our understanding on the formation, structure and characteristics of HS and NOM and on the role of HS and NOM in carbon transformation, dynamics, and sequestration in the environment would contribute to developing innovative management strategies to minimize its impact on climate change.

Humic substances and soil organic matter are vital to maintaining soil fertility and closely related to biogeochemical cycling of nutrients, environmental toxic elements and anthropogenic organics. Decomposition of HS and NOM supply both nutrients and energy for plants and microbial organisms. The interactions at the organic-inorganic complexes and organo-mineral-microbe interfaces profoundly affect the physicochemical and biological processes such as migration, transformation, dissipation, etc., thereby affecting the availability of nutrients and the toxicity of toxic elements and anthropogenic organics. However, there are knowledge gaps on how and to what extent the processes are affected by HS and NOM. The dynamics, transformations, bioavailability, and toxicity of toxic elements and anthropogenic organics should be influenced enormously by the chemistry and transformations of HS and NOM.

Nanoparticles are discrete atom assemblies at nanometer (10^{-9} m) scale. Biochar is a carbon-rich product produced from any source of biomass by pyrolysis. The biogeochemical and ecological impacts of nanoparticles and the characteristic and function of biochar in the environment are some of the fastest growing areas of research today, with not only vital scientific but also environmental, economic, and societal consequences. Little is known about the distribution, formation, transformation, structural and surface chemistry of naturally occurring (HS and NOM) and engineered nanoparticles and their biogeochemical and ecological impacts. Extensive investigations are necessary to improve the understanding for the functions and mechanisms of biochar in the environment

Natural and commercial HS have been applied in agriculture as organic fertilizer, soil ameliorator, and/or crop growth stimulator. They have also been used in industry and for wastewater treatment. However, there exist great knowledge gaps on the effectiveness and environmental consequences of the applied HS. The research on this subject matter should, thus, be an issue of intense interest for years to come.

The objective of the conference is to provide a forum for the interactions and communication of chemists, microbiologists, and physicists, with allied scientists including pure chemists, biologists, environmental scientists, soil scientists, water scientists and ecologists, to address the current state-of-the-art on "Functions of Natural Organic matter in the Changing Environment". The main sessions of the conference were: (1) formation, structure and characteristics of HS and NOM; (2) HS/NOM and carbon sequestration; (3) HS/NOM and biogeochemical cycling of nutrients; (4) HS/NOM and the environmental processes of toxic elements and anthropogenic organics; (5) HS/NOM, naturally occurring and engineered nanoparticles; (6) HS/NOM, biodiversity and ecosystem health; (7) HS/NOM in water and water treatment; (8) characterization and function of biochar in the environment; and

(9) Industrial products and application of HS. Twenty-one distinguished scientists worldwide will be invited to give keynote speaches in the 9 sessions of the conference.

The conference will be held in Zhejiang University, Hangzhou, China on September 9-14, 2012, on the occasion of the 30th Anniversary of IHSS. Zhejiang University, founded in 1897, is a comprehensive research university with distinctive features and a national as well as international impact. Research at Zhejiang University spans 12 academic disciplines, covering philosophy, economics, law, education, literature, history, art, science, engineering, agriculture, medicine, management and so on. With 7 faculties and 37 colleges/schools, Zhejiang University has 14 primary and 21 secondary national leading academic disciplines. According to Essential Science Indicator (ESI) ranking about 22 disciplines, Zhejiang University ranks among the top 1% in 14 disciplines, and comes in 4th among the list of the top 100 academic institutions of the world. At present, there are a total of more than 44,000 full-time students enrolled at Zhejiang University, including approximately 13,800 graduate students, 7,700 Ph.D. candidates, and 22,600 undergraduates. In addition, there are about 2,700 international abroad students currently studying in Zhejiang University.

The participants of this conference were from 5 continents: Asian delegates from China, India, Iran, Israel, Japan, Mongolia, Pakistan, the Republic of Korea, and Turkey; European scientists from Austria, Belgium, Croatia, Czech Republic, Estonia, France, Germany, Greece, Ireland, Italy, Latvia, Norway, Poland, Portugal, Russia, Spain, Sweden, the Netherlands, the UK, and Ukraine; Australasian participants from both Australia and New Zealand; delegates from Argentina, Brazil, Canada, and the USA in the Americas; and representatives from Egypt, Nigeria on the African continent.

It is the first time to hold such a large-scale international conference of International Humic Substances Society in China. It is hoped that the conference would lead to identification of gaps in knowledge and as such to provide future research directions and promote research on the characterization, function, application of HS in environment, agriculture, and industry. This is expected to lead to advancing the frontiers of knowledge on biophysico-chemical processes related to HS and NOM in the environmental systems and their biogeochemical and ecological impacts, and also promoting education in this extremely important and challenging area of science for years to come, which is also expected to contribute toward the international advancement of environmental chemistry and its impacts on the terrestrial and aquatic ecosystems.

The book of proceedings is composed of extended abstracts that present new ideas, findings, methods, and experience on the 9 sessions of the conference. All the extended abstracts have been subject to peer review by external referees, by International Scientific Committee members of the conference, and by the editors of the proceedings. On behalf of the Organizing Committee, we would like to thank members of the International Scientific Committee and the authors for their invaluable collaboration. Special thanks are extended to our sponsors: International Humic Substances Society (IHSS), Zhejiang University, National Natural Science Foundation of China (NSFC), Soil Science Society of China (SSSC), Organization for the Prohibition of Chemical Weapons (OPCW), and Zhejiang Provincial Key Laboratory of Subtropical Soils and Plant Nutrition.

Dr. Jianming Xu
Chair of the IHSS 16

July 2012

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