# Plenary 1

## Professor Xinde Cao


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### Profile
Dr. Xinde Cao is a professor of Environmental Chemistry and vice dean of School of Environmental Science and Engineering at Shanghai Jiao Tong University, China. His research areas include: (i) remediation and restoration of contaminated soils and groundwater; (ii) multiple interfacial processes of contaminants in soil and its environmental behavior; (iii) biological carbon sequestration in soil and its ecological effects; and (iv) development and application of solid waste-derived environmental functional materials. As a Principal Investigator (PI) or co-PI, Dr. Cao has been and is being in charge of about 20 projects which are supported by China NSF, MOST, MEP, etc. Dr. Cao has received 4 state-level awards including the 1st Place Award of Science and Technology Progress by the China ME. He has published more than 110 SCI-indexed research papers in the refereed journals including Environ. Sci. Technol., etc. His research achievements are recognized world widely, with the total SCI citations of >5500 and h-index of 35 (web of science), and 11 papers are ranked as top 1% of ESI. He has been recognized as one of Most Cited Chinese Researchers since 2014. He has completed 5 book chapters including 3 in English. Dr. Cao currently serves the Journal of Chemosphere as Associate Editor and the Journal of Environmental Science and Pollution Research as Editorial Board member.

### Title
Advanced Application of Heavy Metals-laden Biochar after Wastewater Treatment for Supercapacitors


### Abstract
Biochar is a C-rich material obtained from biomass pyrolysis. Biochar has been proven as an effective sorbent for the removal of metals in water and wastewater. The biochar after metal sorption (exhausted biochar) could be a potential hazardous waste which could lead to secondary pollution and be harmful to the surrounding environment. Until now, there is no research exploring the reuse of exhausted biochar. This study attempted to create a novel way of reuse by converting the metal-loaded biochar into supercapacitor.

Biochars were produced from wood chips, dairy manure and sewage sludge and subjected to loading of Ni(II), Co(II) and Mn(II) from aqueous solutions. The metal-loaded biochar underwent microwave or plasma oxidation treatments for fabrication as a supercapacitor. The specific capacitance of biochar supercapacitor increased with metal-loading, especially for the loaded biochar after treatment with microwave or plasma, in which the capacitance increased by over 2-5 times compared to the raw biochar supercapacitors. The increase of capacitance in the metal-loaded biochar supercapacitor was mainly attributed to the conversion of Ni(II), Co(II) and Mn(II) into NiO/NiOOH, $CoO/Co_2O_3$ and $MnO/MnO_2$, respectively, evidenced by X-ray diffraction and X-ray photoelectron spectroscopy. The biochar supercapacitors, especially oxidized metal-loaded biochar supercapacitors, exhibited the high stability of specific capacitance with only less than 2% loss after 1000 charge-discharge cycles.

This study demonstrated that metal-loaded biochar can be further utilized for generation of supercapacitor, providing a potential way for the reuse of exhausted carbonaceous sorbents. More importantly, the way created in this work may not only solve the metal-laden sorbent waste disposal but also expand utilization of biochar as an effective energy storage device, both of which has a great significance of environmental sustainability.

## Plenary 2

# Associate Professor Kuk Cho


### Affiliation

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### Profile

Kuk Cho is Associate Professor of Department of Environmental Engineering at Pusan National University (PNU). He received his doctorate from Washington University in St. Louis, USA in 2005 in nanoparticle synthesis and growth. He then worked as a postdoctoral researcher at University of Maryland, College Park, USA (1 year) about nanoparticle control. He then worked at the Korea Institute of Geoscience and Mineral Resources (5 years) in nanoparticle synthesis at Daejeon, Korea. He was appointed as an Assistant Professor at Pusan National University in 2011 and promoted to Associate professor in September 2015. His research interests include 1) aerosols and its health effects, 2) sorption of inorganics (e.g., radionuclides, heavy metals) from water, and 3) oxidation of organics (e.g., volatile organic compounds) using catalysts in air and water.

### Title

Aerosol and Its Implications on Health


### Abstract

Particulate matter (PM) in air is a serious problem in some places including Korea and China. PM has been classified as a carcinogen (Group 1) by the World Health Organization (WHO). The concentrations of PM2.5, which is the particulate matter smaller than 2.5 μm, and PM10 are above the WHO guidelines. In this talk, we will look over the effect of PM on health by answering questions on the following aspects of PM: concentration, size, and substance. First, what is the concentration increase effect of PM2.5 and PM10 on various disease? Second, PM2.5 and PM10 is enough to describe health issues by PM? Is there a chance for smaller-sized PM to cause different disease? Finally, if the concentration and the size are same, the health effects of different kinds of PM will be same? If not, which kind of PM is more dangerous? The above questions require more researches to conclude them, but it is still meaningful to look over the current status.

## Plenary 3

# Professor Naoji Yamamoto

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**Profile**

Dr. Naoji Yamamoto is a professor of department of advanced energy engineering school of engineering sciences, Kyushu University Japan. His research areas include: (i) Advanced Space Propulsion system; (ii) Plasma diagnostics including optical diagnostics, electrostatic probe diagnostics (iii) Ball lighting physics. As a Principal Investigator (PI) or co-PI, Dr. Yamamoto has been and is being in charge of about 20 projects which are supported by JSPS, MEXT, etc. Dr. Yamamoto has received several awards including the commendation for science and technology by the minister of education, culture, sports, science and technology, the young scientists'. He has published more than 70 research papers in the refereed journals including journal of propulsion and power, etc.

**Title**

Challenges Of Electric Propulsions

**Abstract**

An Electric propulsion is one of the rocket engines, work by pushing ions and neutral atoms away from the spacecraft using electric power. The action of the heavy particles leaving the thruster causes a reaction that pushes the spacecraft in the opposite direction. Electric propulsions produce high energy transfer efficiency with good specific propellant consumption. Therefore, Electric propulsions have already been used extensively in space missions, such as Deep space 1, HAYABUSA, and among other missions.

Current trends are toward increased power levels and decreased power levels. High power electric propulsion will be used as a main propulsion of the Cargo for manned mission to Mars, as well as that for the construction of heavy space structures like the space solar power system. Small power electric propulsion is and will be used as a main propulsion for micro satellites. The adoption of small satellites, with their flexibility, short development time and low cost, has been a breakthrough in space applications. The demand for mN class miniature propulsion systems is expected to grow in the future, since the adoption of small electric propulsions into small satellites will expand their ability, that is, missions such as Mars exploration, self-disposal of satellites, among other missions would become possible.

I will talk about missions using electric propulsion and brief explanation about the principle of electric propulsion and the challenges of electric propulsion.