Preliminary studies on physicochemical characterization of $PM_{2.5}$ collected in underground and ground-level rail systems Shanghai metro

SENLIN LU[1*] HAO XIAOJIE[1] LIU DINGYU[1] ZHANG RONGCI[1] YI FEI[1] GU YAN[1] LUO WENYUN[1*] LIN JUN[2] AND YONEMOCHI SHINICHI[3]

[1]School of Environmental and Chemical Engineering, Shanghai University, Shanghai 200444, China
[2] Shanghai Institute of Applied Physics, Chinese Academy of Sciences, Shanghai 201800, China
[3] Center for Environmental Science in Saitama, Saitama 374-0115, Japan

Metro systems are an important transportation mode in megacities across the word. Few works focused on fine particles in the atmosphere of metro. A campaign was conducted to investigate physicochemical characterization of ambient fine particles (PM2.5, D<2.5μm) in the atmosphere of underground and metro station of Shanghai rail system. Proton induced X-ray emission (PIXE) technique, field energy scanning electronic microscopy (FESEM) and synchrotron radiation X-ray absorption fine structure (XAFS) were employed to analyse chemical elements and microscopic characterization of $PM_{2.5}$. Our results showed that mass level of $PM_{2.5}$ in the air of underground of Shanghai metro system (42.17±23.74 $\mu g/m^3$) was higher than that of $PM_{2.5}$ collected out of metro station (21.54±6.86 $\mu g/m^3$). The $PM_{2.5}$ was mainly consisted by fly ashes, mineral particles. Al, Si, Ca, S, Fe, Cu, Na, Mg, K, V, Cr, Mn, Zn, Ba, Re, Ti, Cl could be found in the fine particles. Al, Si, Ca, S and Fe were the main elements. Their mass level followed Si>Al>Ca>S>Fe. Considering speciation of trace elements playing key role in their toxicological effects, speciation of copper was selected to be analyzed by XAFS. The XAFS results demonstrated speciation of Cu in fine particles ($PM_{2.5}$) is present as Cu (I), while significant amount of Cu is present as Cu (II) in the ultrafine particles ($PM_{0.1}$). Armed with the above results, celluar toxicity will be carried out to assess health risks induced by fine particles in the atmosphere of Shanghai metro system.

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I/Ca evidence for upper ocean deoxygenation during the Paleocene-Eocene Thermal Maximum

ZUNLI LU[1]*, ELLEN THOMAS[2], XIAOLI ZHOU[1], ROSALIND E.M. RICKABY[3] AND ARNE WINGUTH[4]

[1] Department of Earth Sciences, Syracuse University, Syracuse, NY, 13244, USA. zunlilu@syr.edu
[2] Department of Geology and Geophysics, Yale University, New Haven, CT, 06511, USA
[3] Department of Earth Sciences, University of Oxford, South Parks Road, Oxford, OX1 3AN, UK
[4] Department of Earth and Environmental Sciences, University of Texas at Arlington, Arlington, TX 76019, USA

Anthropogenic global warming affects marine ecosystems in complex ways, but the possibility of declining oxygenation is a growing concern. Forecasting the extent, rate and intensity of future ocean deoxygenation and its effects on oceanic biota remains highly challenging because of the complex feedbacks in the earth-ocean-biota system, and the lack of sensitive proxies to reconstruct oceanic oxygen levels of the past [2]. Information from past events such as the Paleocene-Eocene Thermal Maximum (PETM, ~55.5 Ma), possibly the best geological analog for modern global warming, may help in such forecasting. During the PETM, low-oxygen conditions were widespread along continental margins, but there is no evidence that deoxygenation was global and extended into open oceans. We apply a novel paleo-redox proxy, iodine to calcium ratios, in bulk foraminiferal tests (>63μm coarse fraction). The oxidized form of iodine (iodate, IO_3^-), but not the reduced form iodide, can be incorporated in the calcite structure, thus preserving information about paleo-redox changes. Our results indicate horizontal and vertical expansion of the Oxygen Minimum Zone (OMZ) in the Pacific, Atlantic and Indian oceans following the emission of isotopically light carbon into the ocean-atmospheric system during the PETM.

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