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New analytical method for simultaneous measurement of multiple organic tracers in aerosols

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Biomass burning and fungal spores can have serious adverse effects on human health and regional air quality. Due to the complexity of their emissions, it is more reliable to utilize organic aerosol tracers to estimate their impacts. Levoglucosan and its isomers mannosan and galactosan are ideal biomarkers for biomass burning, while arabitol and mannitol are widely used as good tracers for fungal spores and biogenic aerosols. As these compounds have poor volatility and thermal stability, derivatization is normally required before their analysis under high temperature. For the determination of these five organic tracers, though GC-MS is widely applied in most studies, this method demands organic solvents for extraction and it is less cost-effective and very time-consuming; in addition, it can also cause the loss of target compounds due to derivatization. In addition, no single analytical method has so far been reported for one-step simultaneous measurement of the abovementioned 5 organic tracers. Hence, this study was to develop a new high-performance liquid chromatography-electrospray ionization-tandem mass spectrometry (HPLC-ESI-MS/MS) method to analyze these 5 polar organic compounds in aerosols without any derivatization pre-treatment to greatly reduce sample preparation time. Ultrapure water instead of organic solvent is applied as an extraction solvent under ultrasonic condition. After obtaining the optimized analytical conditions, the LOD, linear correlation, recovery of spiked standards, reproducibility of standards and aerosol samples were tested to demonstrate the reliability of the newly developed process for determining these tracers. Lastly, both extraction and analytical methods developed were applied to the real-world aerosol samples that were collected in four representative sites of Yangtze River Delta (YRD) in China to study their profiles, which has shown this method to be a convenient and efficient way to investigate the impacts of biomass burning and fungal spores to regional air quality.

Biography

Jun He has received his BSc and MEng from Nankai University, China and PhD from National University of Singapore. After Postdoctoral research in Singapore-Delft Water Alliance (2009-2010) and working in Siemens Global Research Centre (2010-2011) in Singapore, he joined The University of Nottingham Ningbo China, taking up Assistant Professor (2011) in the Department of Chemical and Environmental Engineering and got promoted to Associate Professor in 2014. He is specialized in environmental science and engineering, mainly including (but not limited to) research areas in: Atmospheric chemistry, air pollution control, water quality and adsorbent media development, soil contamination and remediation, etc.

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