北京理工大学
Beijing Institute of Technology

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Direct Measurements of Hygroscopicity, Water Transport Kinetics and Viscosity of Glassy Organic Aerosol

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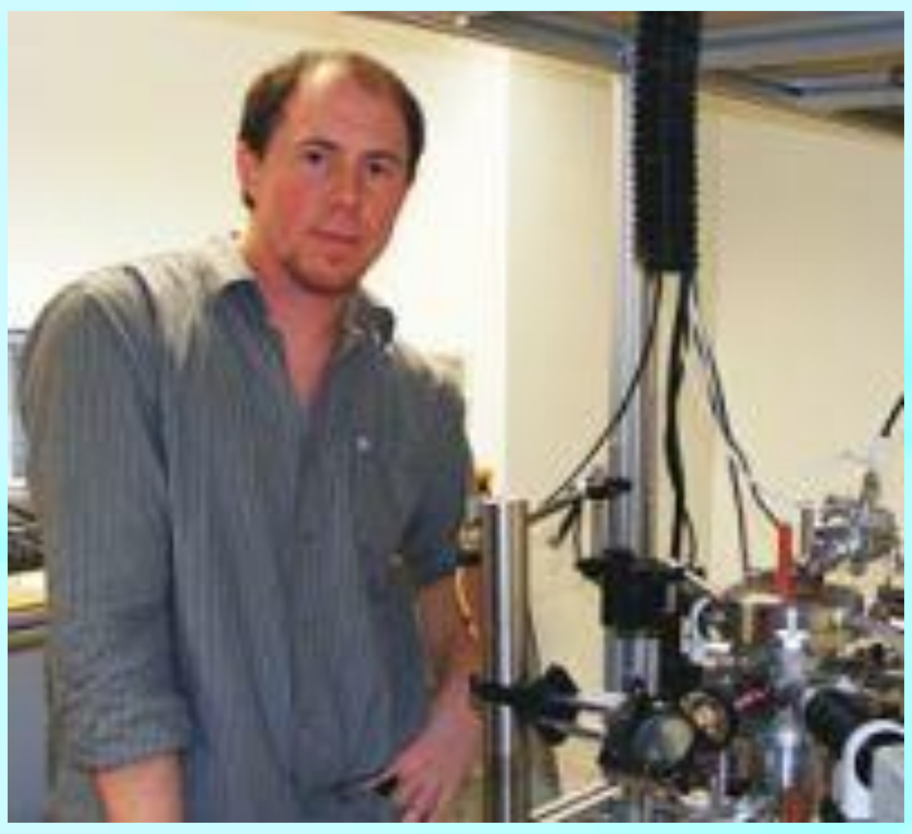

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工作经历：

2013-现在 布里斯托大学气溶胶科学研究中心，Research Fellow
2009-2013 布里斯托大学气溶胶科学研究中心，Post-Doc research assistant
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研究方向：

气溶胶，气溶胶毒性，大气化学，仪器开发等，出版物22篇，在12次国际会议和机构中做报告

Viscous, also termed glassy, aerosol is abundant in the atmosphere. Quantifying the interactions between glassy aerosol and water vapour is crucial for understanding the formation of cloud condensation nuclei and ice nuclei in the atmosphere, and the partitioning of semi-volatile species between the particle and gas phases. A glassy aerosol is defined as a non-crystalline material and a disordered amorphous solid. Often, the Stokes-Einstein equation is assumed to relate molecular diffusion constants and viscosity and, at the viscosities typical of glasses suggest that the composition of atmospheric particles may be governed by kinetic rather than thermodynamic factors. We will assess the validity of the Stokes-Einstein equation through direct measurements of the relative humidity (RH) dependence of the viscosity of organic aerosol and the timescale for water transport during condensation and evaporation. Measurements of the water transport in organic aerosol were made on single particles using the aerosol optical tweezers technique. The water activity dependence of the diffusion constant of water can be determined from measurements made over transitions between many pairs of RH values. The viscosity of an aerosol droplet can be inferred from measurements of the timescale for the binary coalescence of two individual trapped aerosol particles using holographic optical tweezers. A comparison of the diffusion constants of water and the viscosity of the organic particle at the same water activity will be used to illustrate the significant errors in assuming the validity of the Stokes-Einstein equation. Measurements will be presented for a range of binary component aerosol containing organic compounds with a broad range of chemical functionalities and for more complex multicomponent aerosol.