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Hierarchical nanotube self-assembly by DNA minor groove binding ligand DB921 via alkali halide triggering

Self-assembling systems comprise of materials that enable complex structures to form from molecular building blocks without external impetus. In particular, the chemical and physical properties of the self-assembled structure are encoded in the corresponding characteristics of the building blocks, thereby offering the potential for rationally designed materials with properties that are tailored to specific applications. However, the assembly process is often driven by a subtle interplay of multiple intermolecular forces such as electrostatics, hydrogen bonding, and solvent interactions. Any control and rational design is thus predicated on a thorough understanding of these fundamental driving interactions. We describe a novel self-assembling, supramolecular nanotube system formed by a heterocyclic cationic molecule, DB921 [1]. Our structural characterisation work via small-angle X-ray/neutron scattering (SAXS/SANS) along with cryo-transmission electron microscopy, evidence a hierarchical assembly mechanism via helical intermediates that is triggered by the addition of alkali halide salts. It is thus proposed that the primary driving interactions for the assembly are ionic interactions and the formation of aromatic pi-pi stacking interactions. Importantly, it is found that this alkali halide provides a convenient handle for modulating key properties of the system. Our time-resolved SAXS studies highlight a critical anion concentration above which the rate of self-assembly is greatly enhanced, whilst altering the choice of the halide anion between chloride and bromide results in different nanotube diameters.

1. R. Mizuta et al., *Nanoscale* 10 (2018), 5550-5558.

Preferred topic

Other

Primary authors: Mr MIZUTA, Ryo (University of Cambridge); Dr MITCHELL, Edward P. (European Synchrotron Radiation Facility); Prof. FORSYTH, Trevor V. (Institut Laue-Langevin); Dr HAERTLEIN, Michael (Institut Laue-Langevin); Dr RANNOU, Patrice (Universite Grenoble Alpes, CNRS, CEA, INAC-SyMMES); Dr SCHWEINS, Ralf (Institut Laue-Langevin); Prof. NEIDLE, Stephen (University College London); Prof. WILSON, W. David (Georgia State University); Prof. BOYKIN, David (Georgia State University); Dr FARAHAT, Abdelbasset A. (Mansoura University); Dr MOSSOU, Estelle (Institut Laue-Langevin); Dr MUNNUR, Deeksha (University of Oxford); Dr ROUND, Adam (European XFEL, Hamburg); Dr NARAYANAN, Theyencheri (European Synchrotron Radiation Facility); Ms WEBSTER, Jessica (Institut Laue-Langevin); Ms LING, Wai Li (Institut Biologie Structurale); Ms DEVOS, Juliette (Institut Laue-Langevin)

Presenter: Mr MIZUTA, Ryo (University of Cambridge)