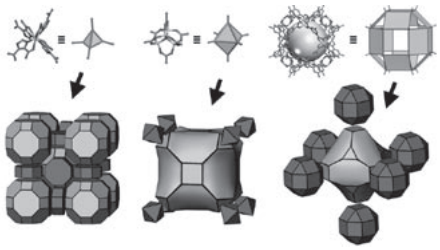
highly functional character. The molecular building block (MBB) approach introduces the ability to generate rigid and directional building blocks, mostly *in situ*, for the construction of MOMs having specific underlying networks and/or targeted functions/properties. Here we will discuss three basic strategies based on the MBB approach. Three classes of MBBs can be targeted and utilized in the assembly of functional MOMs: 1) single-metal-ion-based MBBs, which promote the rational construction, by forcing rigidity and directionality through control of the metal coordination sphere and judicious selection of suitable hetero-functional (N-, O- coordination) organic ligands, of porous MOMs with extra-large cavities, including zeolite-*like* metal-organic frameworks (ZMOFs); 2) multi-nuclear metal cluster-based MBBs, where, for example, simple metal-carboxylate clusters possess multiple metal-oxygen coordination bonds that result in the generation of rigid nodes with fixed geometry that, when combined with organic ligands of specific geometry, lead to the construction of desired MOMs (e.g. *soc*-MOFs); and 3) supermolecular building blocks (SBBs), which involve enhanced built-in directional and structural information (e.g. high degree of symmetry and connectivity) compared to simple MBBs and allow the construction of high-connectivity nets (e.g. *rht*-MOFs). The MBB approach and associated strategies, as well as physical properties of some corresponding MOMs, will be presented.



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Atoms and spins in novel multiferroics: A new twist to an old relation

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In the broadest interpretation, multiferroics are materials that display complex ordering phenomena, with at least two coupled order parameters capable of responding to different external fields. Magneto-electric multiferroics in particular have an obvious appeal as functional paradigms, since they display coupled responses to electrical and magnetic fields, and can therefore be "switched" and "read" with different external stimuli and probes. Recently, an entirely family of "novel" multiferroics has emerged, in which, unlike conventional multiferroics, the onset of electrical polarization coincides with a magnetic ordering transition. Many of these materials have been known for decades, often as "odd" examples of complex antiferromagnets, but they multiferroics properties were completely overlooked. The attractive feature of these systems is not so much the electrical polarization, which is several orders of magnitude smaller than for typical ferroelectric but rather the very large cross-coupling between magnetic and electrical properties. The key to understand these remarkable effects lies on one hand in the magneto-elastic interactions coupling spins, atoms and electrons at the microscopic level, and, on the other hand, in the subtle lowering of the magneto-crystalline symmetry from a non-polar to a polar point group. Crystallography, intended as the study of symmetry and of the normal modes that break it systematically, continues to play a starring role in the study of novel multiferroics. I will present a number of examples to show how the crystallographic determination of the atomic and spin structures and their evolution with temperature, pressure, magnetic and electric field has provided compelling evidence to unravel the physics of multiferroics.

Keywords: multiferroics, magnetic structures, phase transitions

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Structure of the FhaC translocation pore : Insights into transport across the bacterial membrane

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The superfamily of Omp85/TpsB membrane proteins includes essential proteins such as the Toc75, Sam50/Tob55 and Omp85/YaeT homologs, which are the cores of large hetero-oligomeric complexes involved in protein transport across, and insertion of beta-barrel proteins into, the outer membrane of chloroplasts, mitochondria and Gram-negative bacteria. It also includes TpsB transporters, which are components of the "Two-Partner Secretion" (TPS) systems in Gram negative bacteria. TPS systems secrete large, mostly beta-helical proteins called "TpsA" that serve as virulence factors. FhaC, the outer-membrane transporter that secretes the Bordetella pertussis adhesin filamentous haemagglutinin (FHA) is one of the most characterized TPS system. The structures of FhaC (1-4) and of FHA (5) have been determined, providing structural insights into this secretion process. The structural and functional data on the FhaC/FHA system will be presented. They allow to propose a model for transport of FHA across the outer membrane, which may apply more generally to the secretion of TpsA proteins by their dedicated TpsB transporters. In conclusion, we have determined the first crystal structure of a member of the Omp85-TpsB transporter superfamily. It offers molecular insights into how proteins get into and across cellular membranes.

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Keywords: bacterial membrane, protein transport, POTRA

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Crystal engineering of co-crystals and their relevance to pharmaceuticals and solid-state chemistry

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The field of crystal engineering has evolved in such a manner that it has become synonymous with synthesis of new classes of organic and metal-organic compounds. Crystal engineering invokes self-assembly of existing molecules or ions and therefore means that a wide range of new compounds can be generated without the need to invoke covalent bond breakage or formation. This presentation will address a long-known but little studied class of compound,