

P028 Extended nano-scale order in a designed protein fibre
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An ability to design nanostructured self-organising systems from the bottom up would have an impact on nanoscale science and technology. Natural peptide and protein-based systems offer inspiration for such experiments. Elsewhere we have described the design of two peptides that co-assemble to form long protein fibers in water. This system can be rationally engineered to alter fiber assembly, stability and morphology. Here we show that slight modifications to our original peptide designs lead to structures with a remarkable level of order on the nanoscale that mimics certain natural fibrous assemblies. Specifically, the fibers observed by positive and negative-stain transmission electron microscopy (TEM) display striations separated by nanoscale distances (4.2 and 5.3 nm) that precisely match the size of the peptide building blocks (figure 1). Furthermore, the surface patterns extend unbroken across the widths (50 nm) and lengths (>10 μm) of the fibers. X-ray fiber diffraction experiments show that the peptides are aligned longitudinally to the fibers main axis and hexagonally packed across the fibres. These features reflect a high level of internal order within the fibers introduced by the peptide design process. To our knowledge, these observations are unique for a biomimetic system and represent a step towards rational bottom-up assembly of nanostructured fibrous biomaterials for applications in nanobiotechnology.