



# Sequential, Multistep, and Cooperative Helicity Evolution in Supramolecular Polymers of Chlorophyll Rosettes

by Balaraman Vedhanarayanan et al.

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## PAYWALLED ARTICLE

Hello {{lead.First Name:default=researcher}},

Greetings from [AFM Materials Journal Club](#). In this month's edition, I would like to share the recently published article "[Sequential, Multistep, and Cooperative Helicity Evolution in Supramolecular Polymers of Chlorophyll Rosettes](#)" from *Journal of the American Chemical Society*.

Researchers from the SRM Institute of Science and Technology and Chiba University applied atomic force microscopy (AFM) with [MultiMode 8](#) to resolve how supramolecular helicity emerges and evolves over time.

### Methods and Results

AFM [PeakForce Tapping \(ScanAsyst\)](#) imaging enabled direct, real-space visualization of chlorophyll rosette-based fibers as they transitioned from initially formed, nonhelical metastable assemblies into progressively twisted helical polymers. By capturing morphological changes at different aging stages, AFM revealed discrete steps in helicity tightening, including changes in fiber width, pitch, and handedness that could not be inferred from ensemble-averaged techniques alone.

Importantly, AFM provided nanoscale evidence for cooperative growth, where adjacent helical segments promoted further twisting. These AFM observations complemented circular dichroism and scattering data, but uniquely distinguished local supramolecular chirality from molecular-scale chirality, highlighting the power of AFM for structure-property correlations in complex soft supramolecular systems.

This study establishes a rare, well-defined example of dynamic, multistep helicity evolution in synthetic supramolecular polymers, closely mimicking the pathway complexity seen in biological assemblies.

### Broader Impact

The combination of AFM with spectroscopic and kinetic modeling shows that supramolecular order does not emerge in a single thermodynamic step, but rather through a rugged energy landscape with kinetically trapped intermediates. From a materials viewpoint, the discovery that supramolecular helicity and even apparent

handedness can change over time has important implications for chiral optoelectronic, photonic, and energy harvesting materials based on chlorophyll analogues.

## The Role of AFM

The AFM results resolved discrepancy between supramolecular chirality and chiroptical signals, which further underscores the need for nanoscale, surface-sensitive probes when designing functional chiral systems. Overall, this study positions AFM as an indispensable tool for decoding time-dependent self-assembly mechanisms in next-generation supramolecular polymers.

I hope you find this research interesting. Please feel free to [contact your local Bruker Applications Team](#) if you would like to discuss this topic further.



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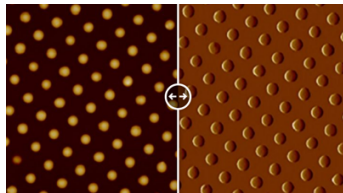
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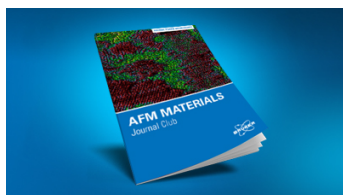


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