Synthetic carbohydrate materials

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Polysaccharides are the most abundant organic materials in nature, yet correlations between their three-dimensional structure and macroscopic properties have not been established. Automated glycan assembly (AGA) enables the preparation of well-defined oligo- and polysaccharides resembling natural as well as unnatural structures.\(^1\)

These synthetic glycans are ideal probes for the fundamental study of polysaccharides, shedding light on how the modification patterns affect the polysaccharides properties (i.e. solubility and crystallinity). Molecular dynamics simulations and NMR analysis show that different classes of polysaccharides adopt fundamentally different conformations, drastically altered by single-site substitutions.\(^2\)

Moreover, these synthetic oligosaccharides are able to self-assemble into nanostructures of varying morphologies.\(^3\) Well-defined differences in chain length, monomer modification, and aggregation methods yield glycomaterials with distinct shapes and properties.