Self-assembly of oligosaccharides: towards tunable hydrogels

Nives HRIBERNIK [1], Marlene DAL COLLE [1], Martina DELBIANCO [1]

[1] Max Planck Institute of Colloids and Interfaces, Potsdam, GERMANY

nives.hribernik@mpikg.mpg.de

Self-assembly is a process commonly utilized in nature to build functional structures and has been extensively studied for biomolecules such as peptides and nucleic acids. In contrast, the mode of aggregation and types of intermolecular interactions of oligosaccharides remain unexplored due to synthetic and analytic challenges associated with carbohydrates. Recently, systematic studies on supramolecular organization of oligosaccharides were enabled by the advent of automated glycan assembly, allowing access to collections of oligosaccharides with well-defined length and composition. [1]

Here, we showed how insights into the self-assembling behavior of oligosaccharides inspired the creation of dynamic supramolecular hydrogels with tunable properties. We utilized cellulose oligomers to build the hydrogel backbone, as cellulose is the most abundant natural polysaccharide exhibiting a high tendency to form crystalline supramolecular assemblies. [2] The cellulose-based oligomers were functionalized with various carbohydrate solubilizing moieties [3], enabling the creation of dynamic supramolecular fibers capable of forming hydrogels (**Fig. 1**). These carbohydrate-based hydrogels mimic the mechanical properties of natural materials (e.g. extracellular matrix) while exposing biologically relevant carbohydrate epitopes. Future applications as mimics of biological environments are envisioned.

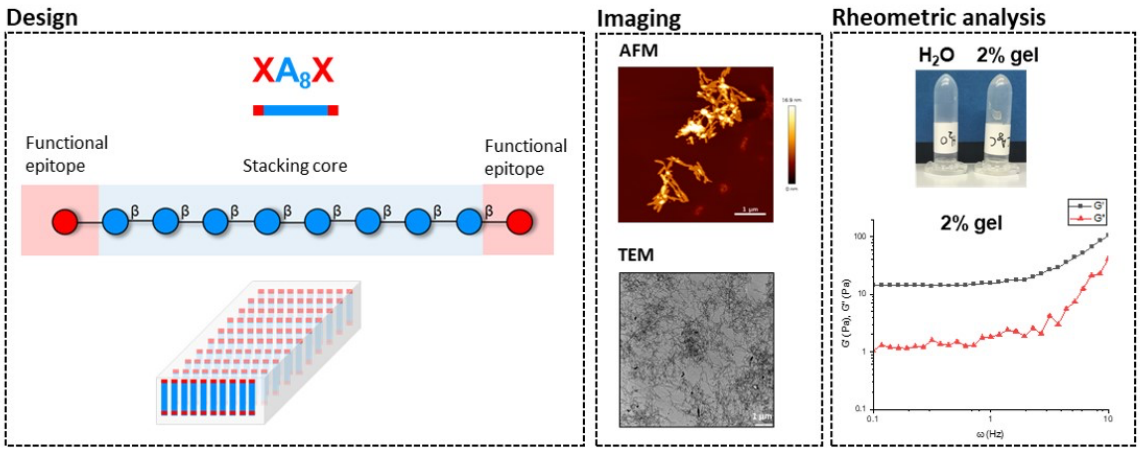

Figure 1: Design and analysis of synthetic carbohydrate-based supramolecular hydrogels.

Bibliographic references:

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