Carbohydrate-Based Material Science and

Creating a Circular Chemical Economy

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Rapid preparation of polysaccharides is by automated glycan assembly (AGA) [1] using a synthesizer [2] provides access to diverse glycans as large as 151-mers [3]. Accelerated synthesis methods [4] now used to synthesize complex glycans including challenging *cis*-linked polysaccharides [5] are enabling fundamental investigations into the structure and function of polysaccharides.

Synthetic glycans are key in combination with single molecule imaging, [6] molecular modelling and other physical methods to characterize carbohydrate structure [7-9]. We use synthetic polysaccharides to address fundamental questions of carbohydrate structure and folding and material science [10]. Synthetic glycans can now be used to construct 3-D shapes from first principles [11] and open a new field for engineering materials from scratch.

The Center for the Transformation of Chemistry (CTC) received €1.25 billion (approx. $1.5 billion) to address one of the most pressing challenges of the 21st century and at the same time establish a place of cutting-edge research for specialists as well as partner institutions from science and industry. The future supply of chemicals and pharmaceuticals must be ensured through local, cost-effective and sustainable production processes mainly from renewable raw materials or recycled materials, while complying with the highest occupational safety and environmental standards and drastically shortening transport routes. [12]

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