

Hierarchical Structures of Polysaccharides

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Polysaccharides, including cellulose, chitin, and starch, etc., form intriguing hierarchical structures during biosynthesis. We use small- and wide-angle scattering techniques, including X-ray and neutron scattering, to characterize these structures at multiple length scales, ranging from dimensions of crystal unit cell to nano- and tens of nanometers. Cellulose and starch granule were selected as two model systems, with the former possessing planar conformation and the latter helical. Wide-angle X-ray scattering reveals their polymorphism; and together with small-angle X-ray and neutron scattering, molecular orientation may be associated with nano structures. The structural studies provide insights into understanding biological functions of these polysaccharides, and suggest research directions for developing bio-inspired materials or functional foods.