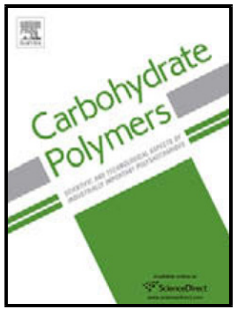

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To Carbohydrate Polymers

Effects of carboxylation of the side chains on the order-disorder transition in aqueous solution of schizophyllan, a triple helical polysaccharide

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Highlights

- The trimer of carboxylated schizophyllan shows the order-disorder transition of the side chain.
- The transition temperature depends strongly on the degree of carboxylation.
- The transition enthalpy is decreased by the carboxylation of the side chains.
- The permanent disordered unit is included in a trimer to change the transition curve.

Abstract

Schizophyllan and scleroglucan are water-soluble polysaccharides having repeating units consisting of three β-1,3-linked glucose residues in the main chain and a single β-1,6-linked glucose residue as the side chain. This polysaccharide dissolves as a triple helix in an aqueous solution and shows a cooperative order-disorder transition between the side chain and solvent molecules while retaining the triple helical conformation. Periodate and subsequent chlorite oxidations selectively modify the side chain glucose to provide the corresponding dicarboxylate units. Optical rotation measurements and differential scanning calorimetry were performed on carboxylated schizophyllan/scleroglucan ('sclerox') samples to investigate the effects of the degree of carboxylation on the order-disorder transition in deuterium oxide with 0.1 M NaCl. The transition curves for the sclerox samples are strongly dependent on the degree of carboxylation. The modified side chains cannot take the ordered structure, resulting in a reduction of the transition enthalpy. The transition temperature for carboxylated schizophyllan becomes lowered and the transition curve broadens with increasing the degree of carboxylation. The permanent disordered units are included in a trimer by the carboxylation to inhibit a long sequence of the ordered units.