Crystalline cellulose in lignocellulose biomass

김성한[1,2,*]
[1]Department of Chemical Engineering, Pennsylvania State University; [2]Department of Chemical and Biomolecular Engineering, Yonsei University
(shkim@engr.psu.edu*)

Cellulose is the most abundant natural polymer on earth and can be a renewable resource for biofuels and chemical production. Being the main structural constituent of plant cell walls, cellulose plays important roles in plant growth as well as recalcitrance of plant to biological degradation. Molecular understanding of the cellulose structure and its interactions with other matrix polymers in biomass is important for development of energy-efficient and cost-effective biomass conversion processes. The selective detection of crystalline cellulose in lignocellulose biomass was demonstrated with sum-frequency-generation (SFG) vibration spectroscopy, which reveals structural information that is not readily obtainable with other techniques. This talk will address quantitative relationships between SFG intensity and cellulose crystallinity in biomass, distinction of cellulose polymorphs (Iα versus Iβ, II, and III), cellulose packing and orientation in primary and secondary cell walls, interactions between cellulose and other cell matrix polymers, and structural changes in cellulose upon pre-treatments.