Design and Fabrication of Cellulose-Based Nanomaterials

a dual-speaker seminar featuring Tetsuo Kondo and Shingo Yokota,
Department of Agriculture and Graduate School of Bioresource and Bioenvironmental Sciences, Kyusho University
Friday, June 8, 2012, 1:00 - 2:30 pm, ICTAS Room 310, Stanger Street

Dr. Tetsuo Kondo is a professor in Kyushu University’s Department of Agriculture and its Graduate School of Bioresource and Bioenvironmental Sciences. Dr. Kondo holds two Ph.D.s—one in wood chemistry from The University of Tokyo and one in polymer physical chemistry from Kyoto University. Dr. Kondo’s research interest is bioalchemy, including nanomaterial design, polymer physicochemistry, and carbohydrate polymer chemistry. He has contributed extensively to both polymer physical chemistry and polysaccharide chemistry through basic and applied research in which cellulose was his main subject. His research interest has extended to the supramolecular architecture of cellulose in native and artificial systems. He has employed wood cell wall cellulose to investigate beta-glucan association in native systems using physicochemical approaches such as microscopic FT-IR, and in situ atomic force microscopy. He also has developed his own techniques in using these analytical tools for polysaccharides polymer. Recently, he has established a new form of cellulose named Nematic Ordered Cellulose which exhibits noncrystalline yet ordered states. More recently, the above NOC template concept with nanobuilding blocks provided by ACC was extended to various football prediction today nanopatterned templates including honeycomb-patterned cellulose films to establish a hierarchical organizing design for 3-D nano/micro architecture of biobased materials using his original “bioalchemy.”

Dr. Kondo’s talk is entitled, “Bio-alchemy using water and biological systems .”

Dr. Shingo Yokota is an assistant professor in the Department of Agriculture and in the Graduate School of Bioresource and Bioenvironmental Sciences at Kyushu University. He earned his Ph.D. in 2007 in agriculture science at Kyushu University where he has been an assistant professor since 2010. Dr. Yokota’s research interests focus on surface modification of biobased nanomaterials. One topic of his research is the surface modification of cellulose nanofibers in an aqueous system. Using only a pair of water jets, Dr. Yokota has prepared cellulose nanofibers from wood cellulose by the aqueous counter collision (ACC) method that allows nanopulverization by selective cleavage of intermolecular interactions. The ACC-treated cellulose nanofibers were acetylated with acetic anhydride using sulfuric acid as a catalyst in an acetic acid system, while the cellulose I crystal structure remained almost unchanged. Moreover, the acetylated nanofibers were homogeneously dispersed in water, indicating that the surface was partially acetylated to prevent interaction between the nanofibers in an aqueous medium. His other target was “nematic ordered cellulose” (NOC) prepared by uniaxial stretching of water-swollen cellulose. The above surface modifications of nano-sized and structured objects derived from cellulose could possibly open a new phase in the functional design of cellulose-based materials.

Dr. Yokota’s talk is entitled, “Interfacial Design of Cellulose-based Nanomaterials by Chemical Modification .”