Hydrogen Bonding Formation and Physicochemical Properties of Chemically Modified Cellulose

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Cellulose derivatives are expected as one of ecofriendly substitutes for the synthetic polymers, because they are biodegradable and sustainable resources, which can be introduced various physicochemical properties by modifying cellulose molecule. This thesis was remarked three points: the first being the establishment of a facile method to determine the distribution of the substituents in the regioselectively substituted *O*-methylcellulose(2,3 MC-n), the second, the elucidation of the effect of the formation of hydrogen bonds and the distribution of methyl groups on gelation in 2,3MC-n and commercially available *O*-methylcellulose (R-MC), and the third, the practical application of randomly and low degree substitution to prepare cellulose derivatives having desired end-use properties.

At first, the method to determine the distribution of methyl groups has developed by introducing ^{1}H-NMR spectroscopy with short measurement time and small amount of samples. This method also can facilitate the measurement of the distribution of methyl groups for R-MC.

The second point has revealed by curve fitting of OH bands of water in the near-IR spectra of 2,3MC-n and R-MC solutions, either in water or dimethyl sulfoxide/water. The gelation of *O*-methylcellulose was attributed to the intermolecular hydrogen bonds between hydroxyl groups at C(6) position of samples and water.

In third point, it was succeeded to prepare durable water-repellent, and flame-retardant cotton fabrics, by randomly and low degree substitution of cellulose with long-chain alkyl groups and pyrophosphoric ester groups, respectively. In both case, important characteristics of cellulose fabrics such as a fabric hand, tensile strength and biodegradability maintained perfectly.