PLENARY LECTURE 1

Highlights from 30 Years of Pure and Applied Research on Chitosans

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When being surrounded by all the eight volumes of 'Advances in Chitin Science', a number of Proceedings from regional chitin conferences, the books by Muzzarelli and Roberts and in addition receiving a steady flow of manuscripts on chitosans for reviewing, it seems quite impossible to select the right 'highlights' for an opening lecture. This lecture will concentrate around the strategy for our own research: Biopolymer engineering. In short it means to study the deacetylation process from chitin to chitosans, the resulting chemical structure and monomer sequence, the conformation and physical properties, and the technical and biological properties for tailoring of commercial uses.
A very important contribution to our understanding of the deacetylation process was published 30 years ago by Sannan, Kurita and Iwakura (Makromol. Chem. (1975) 176, 1191), who reported that chitin exhibit a lower critical solution temperature in strong alkaline solution, and that the deacetylation process could be performed homogeneously in solution in contrast to the commercially used heterogeneous deacetylation process. Chitosans obtained from the heterogeneous process could only obtain full solubility in water when their degrees of deacetylation exceeded about 80% due to the presence of insoluble chitinous material at lower degrees of deacetylation. The homogeneous deacetylation process and the reacetylation of fully deacetylated chitosan have been shown to yield chitosans with a random distribution of the acetylated and deacetylated units. This has opened up for numerous structure-function studies of well-characterized amphiphilic chitosans. Some of this work will be discussed with emphasis on the Biopolymer engineering strategy. Finally some recent work carried out in Trondheim aimed at producing nanoparticles with polyanions like DNA and alginate for use in gene and drug delivery will be discussed.