Summary

Water soluble polymers based on renewable resources, e.g. polysaccharides, cellulosis and starch, are becoming more significant nowadays due to the fact that they are environment-friendly (due to their recycability). Especially due to their CO_2-neutrality, physiological compatability, biodegradability and wide range of application, e.g. as flowenhencer, glue, stabilizer, film forming agents as well as thickener, these polymers have potential uses in different areas of industrial production. The use of hydrocolloids based on renewable resources needs an exact characterization of the polymer in order to achieve defined material properties. This is due to the fact that their characteristical properties vary considerably according to which raw materials are used and their chemical modification. The properties of polymers in solution is mainly given by the molar mass, the radius of gyration and their distributions.

Research into polysaccharides and their derivatives in aqueous solutions has so far been incomplete, because of their complex structure and their tendency to build up superstructures (associates and aggregates).
In the course of this thesis, selected water soluble polysaccharides and their derivatives were characterized in regards of the molar mass, the radius of gyration and their distributions. The analysis of the substances was carried out with a combined absolute method of size exclusion chromtography *SEC* with multi-angle laser light scattering *MALLS* and concentration detection via refractive index measurements *RI*. The average molar mass M_w, the radius of gyration R_G and their distributions were determined with the aid of the combined method. In addition the parameters for drawing up structure-property-relationships had to be determined. The structure-property-relationships determined in this thesis are the Mark-Houwing-relationship ($[\eta]$-*M*-relationship) and the R_G-*M*-relationship which describe a link between the molar mass and the intrinsic viscosity $[\eta]$ or the radius of gyration R_G.

Different polysaccarides were examined. These were pullulan and dextran standards for the purpose of specification. From the starch derivatives hydroxyethyl starch *HES* and acetyl starch *AS* were examined and from the cellulosic derivates methyl cellulose *MC*, carboxymethyl cellulose *CMC*, methylhydroxyethyl cellulose *MHEC* and hydrophobic modified hydroxyethyl cellulose *hmHEC* were characterized.

In order to use acetyl starch as a medical application in the field of blood plasma substitution, it is not only the molar mass and its distribution which are important, but in addition its stability when stored in solution (storing stability in solution).

The objetive was the determination of the molar mass, its distribution and the stability of 2-O-acetyl starch when stored in solution. Altogether 13 acetyl starches were investigated. These substances demonstrated a good stability when stored in solution. Several methods, the combined equipment *SEC/MALLS/RI*, the *NMR*-spectroscopy and an enzymatic acetic acid test via *UV/VIS*-spectroscopy were used to validate this.

To compile structure-property-relationships 6 methyl celluloses were examined. Their *DS* was between 1,8 and 2,1 and their intrinsic viscosity ranged from 224 cm^3/g to 1017 cm^3/g. The average molar mass varied from 65.000 g/mol to 351.000 g/mol. With the carboxymethyl celluloses 8 samples of a molar mass series with an average substitution degree of 1 and a molar mass range from 176.000 g/mol to 1.157.000 g/mol were characterized. The determined structure property relationships are listed in table 2.

The influence of aggregating systems was investigated on 14 samples of hydrophobic modified hydroxyethyl cellulose *hmHEC* with deviations in the length of the hydrophobic alkyl chain of 8 to 22 c-atoms and in its hydrophobic content of 0,10 to 3,29 weight percentage. As a result of this investigation 5 samples could be characterized.

The 10 samples of methylhydroxyethyl cellulose could be devided into two groups made out of 3 different modified pulps in different mixing ratios. Due to the mixing ratio variations within a group, samples with differing distribution of the molar mass were produced. The effects on the average molar mass, the radius of gyration and their distributions were determined.

tabel 2: Structure-property-relationships resulting from this survey.

R_G-M-relationship		***[η]-M-relationship***		***25°C***	
K_{RG}	ν	$K_{[\eta]}$	a	Solvent	Substance
$2{,}34 * 10^{-1}$	0,45	$8{,}82 * 10^{-3}$	0,91	0,1 M $NaNO_3$	MC
$2{,}16 * 10^{-1}$	0,47	$1{,}06 * 10^{-3}$	1,05	0,1 M $NaNO_3$	CMC
$4{,}67 * 10^{-2}$	0,46	$1{,}69 * 10^{-1}$	0,46	0,1 M $NaNO_3$	Dextran
$6{,}19 * 10^{-3}$	0,65	$4{,}65 * 10^{-4}$	0,95	0,1 M $NaNO_3$	Pullulan
$3{,}22 * 10^{-2}$	0,57	-	-	0,1 M $NaNO_3$	λ-Carrageenan