**Abstract of PhD thesis Dominik Sikorski**
**"Chemical modification of chitosan".**

Biopolymers and in particular polysaccharides, of which chitosan is one, are of increasing interest to researchers. Biopolymer materials are used as biomaterials in medical applications and in the wider chemical industry. They are characterised by their high biocompatibility, lack of toxicity and biodegradability.

Doctoral thesis presents a comparative study of chitosan degradation in organic acid solutions. The aim of the study was to determine the dependence of chitosan degradation kinetics on acid strength and to determine selected physicochemical and biological properties of chitosan-acid systems.

Researchers working on chitosan have to date mainly focused on its solutions in acetic acid. In the present study, the possibility of using other organic acids such as lactic acid, acetic acid, malic acid and formic acid to prepare chitosan solutions was investigated.

The results of these studies can be considered very important in terms of further utilitarian applications of these solutions. An important issue was to verify their stability over time, which is important in terms of their further processing. The selection of a suitable chitosan dissolution medium is influenced by the value of the acid dissociation constant, which affects their degradation kinetics.

The emphasis is on antimicrobial properties with an emphasis on bacteriostaticity. Chitosan achieves its bacteriostatic properties by protonating the amino groups. In the literature, it is assumed that chitosan alone inhibits bacterial growth. A comparative study of chitosan nonwovens modified with different acids, including acetic acid, propionic acid, butyric acid, valerian acid and hydrochloric acid, is presented. The aim of the study was to determine which acid salts affect the antibacterial and additionally antifungal activity of chitosan-based materials. For the modification (formation of ammonium salts) of chitosan nonwovens, treatment in a saturated vapour environment over an acid solution and modification in a solution of the corresponding acid, ethanol, were used.

Acetic acid and hydrochloric acid proved to be the most effective modifiers of the surface layers of chitosan forms.

The effects of the concentration of the acid solution in ethanol, the treatment time of the chitosan materials with solutions of the respective acids and the effect of the final rinsing process of the modified nonwovens on the antimicrobial activity were investigated.

The results of a study on the preparation of a chitosan film as a model structure containing ciprofloxacin on its surface for use as a model drug are presented. A unique ciprofloxacin structure was obtained, which not only imparts new biocidal properties to chitosan films, but also changes their surface structure.

The form in which the drug binds to the surface of the chitin film was confirmed. Spectroscopic studies showed that in the process of applying ciprofloxacin to the surface of the chitosan film, ciprofloxacin was transformed from a crystalline to an amorphous form, thus improving its bioavailability and range of microbial activity.