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Preparation and characterization of oxidized wheat starch with hydrogen peroxide as an environmentally friendly oxidant

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The starch oxidation involves oxidation of primary or secondary hydroxyl to carbonyl or carboxyl groups, whereas the number of these groups indicates the level of oxidation. Oxidized starch is used as surface sizing agent and coating binder in the paper industry, or as polymeric filler that increases the polymer degradability. The main objective of the presented study is to investigate the effects of various parameters on the oxidation process of the wheat starch, using dry method (Fig. 1). These parameters include oxidizer concentration, catalyst type (iron(II) sulphate, copper(II) sulphate and copper(II) citrate), presence of plasticizers/modifiers (ricinoleic acid, (R-(Z))-12-hydroxy-9-octadecenoic acid, RA) and diisopropyl tartarate ((dipropan-2-yl 2,3-dihydroxybutanedioate, DIPT) and reaction temperature (20 and 80 °C). The obtained results suggest that higher values of carbonyl and carboxyl groups lead to an increase of swelling capacity and solubility, while viscosity decreases, compared to the native wheat starch. The analysis of FTIR spectra, especially region of carbonyl/carboxyl groups absorption, reveals high impact of process parameters on the oxidation degree and band structure. The morphology of native and oxidized starches, investigated by the SEM method, shows that after oxidation the surface of the starch particles becomes smoother than for the native starch, with aggregation of small and large-sized granules.

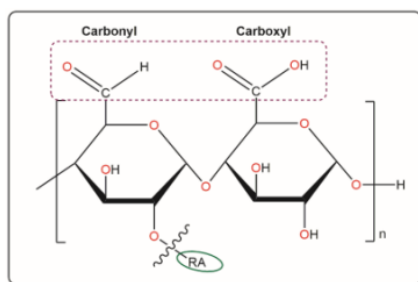


Figure 1. Modified/oxidized starch

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