

## Degradation of cellulose during carboxymethylation

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**Abstract:** An understanding of the macroscopic behaviour of carboxymethyl cellulose (CMC), including the effects of water binder, thickener and emulsion stabiliser, requires a precise knowledge of both the chemical structure and molecular conformation. Experiments were undertaken, in which six different high-purity spruce (*Picea* sp.) sulphite cellulose samples of different degree of polymerisation (DP) were carboxymethylated, two different samples being chosen for more detailed investigation, one low molecular weight sample (LM) and one high molecular weight sample (HM), for comparative purposes. The carboxymethylation was carried out under both homogeneous and heterogeneous reaction conditions. Depending on the carboxymethylation method, different molecular weight (MW) and molecular mass distribution (MMD) values were obtained. Chain degradation during conventional heterogeneous carboxymethylation was increased by increasing the amounts of reagent and the degree of substitution, while the relative chain degradation was independent of the initial molecular weight of the cellulose. The molecular weight degradation was decreased with increasing reactant dosage and by preswelling the cellulose in dimethyl sulphoxide and tetramethyl urea. CMC samples with lower DP values, compared to those manufactured by conventional carboxymethylation, were produced by carboxymethylation under homogeneous conditions and these conditions. A non-random degradation of the cellulose substrate was indicated by the fact that these conditions caused a bimodal molecular mass distribution of the CMC.