335b A Process for the Manufacture of Chemically Produced Toner (Cpt)

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A process for the manufacture of chemically produced toner has been analysed using model materials. As a first step, the impact of pH and temperature in a Couette-type rheometer and in a combination of two mechanically-agitated systems with recirculation between them was studied. The initially-stable 100nm latex suspension at pH ~ 9 was destabilised by the addition of acid. This destabilisation led to the formation of primary aggregates of the original latex suspension of ~ 1 to 2 ìm which, at pH < 4, themselves aggregated to give a closely-packed paste or gel-like structure. This rheologically-complex structure had a yield stress and exhibited internal slippage between primary aggregates at certain shearing conditions. The gel was broken by heating to above Tg, the glass transition temperature, leading to the formation of larger aggregates of ~ 6 to 12 ìm made up of the primary 1 to 2 ìm aggregates, the former being stabilised by raising the pH again to ~ 7. The final near-spherical model CPT product was obtained by heating the 6 to 12 ìm aggregates to >> Tg to cause internal coalescence. Subsequently, using the temperature and pH values established in the initial work, the impact of agitation on the CPT product and its implications for scale up was investigated. The main drivers for the process are pH and temperature but if a product is to be obtained which can meet the typical tight commercial size distribution and morphology specification, then mixing aspects must be understood. The initial stages involving lowering the pH to cause destabilisation, aggregation and gelling required intense micromixing to prevent oversize CPT product. For gel breakage, again intense agitation was necessary to ensure full motion in the gel due to its yield stress. Intense agitation here was also able to reduce the amount of oversize CPT product without producing fines. The changes of rheological property and structure and the physico-chemical and fluid dynamic reasons for them are discussed and put into the framework of a process flowsheet