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Development of plasticized starch biocomposites blended in an original mixer (RMX) based on elongational flows

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This study focuses on the thermo mechanical and rheological behaviour of starch biocomposites formulated by elongational mixer and reactor (RMX). Compared to existing laboratory mixers, RMX device process is characterized by a high contribution of elongational flow and the ability to directly measure the rheological properties of blends. The idea is to promote the elongational flow during mixing of different components and increase the dispersive mixing efficiency. Using RMX, various formulations based on plasticized starch matrix (TPS) have been carried out by varying plasticizer amount, flax fibres content and flax fibers length. After RMX-thermocompression moulding, the impact of process parameters (temperature, speed screw, mixing cycle number) on the viscosity of plasticized starch blends are investigated. Furthermore, morphological and microscopic data on TPS/flax blends prove the high distributive and dispersive mixing efficiency as compared to a classical rotational batch mixer. The evolution of microstructural properties of the starch based biocomposites are also analyzed by X-ray diffraction (DRX), thermo mechanical (DMA) and thermal degradation (TGA) analysis.

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Cationic xylan-METAC copolymer as a flocculant for clay suspensions

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Now a days removal of clay waste from waste water of various industries is a major challenge due to their charge and properties. Flocculation using synthetic polymers has been regarded as a promising process to address this problem. However, there is a growing concern about the use of synthetic polymers in wastewater. To tackle with this problem, natural based flocculants (i.e. biodegradable flocculants) should be used for this purpose. In this work, xylan based cationic flocculant [xylan-2-(methacryloyloxy)ethyl] trimethylammonium chloride (METAC)) was produced and was characterized using gel permeation chromatography, infrared (FTIR) and elemental analysis. The flocculation potential of produced biopolymer in removal of clay wastes was studied using two different types of clay suspensions viz., kaolin and bentonite. The biopolymer was found to be effective in removal of both types of clays via adsorbing on their surface. The removal of clay from suspensions was due to charge neutralization and polymer bridging mechanisms, which is evident from decrease in relative turbidity of clay suspensions and change in zeta potential of clay particles. The percentage removal of bentonite and kaolin clay particles from suspensions was found to be 98 and 80% respectively. The removal of clay particles depends on amount of flocculant adsorbed on their surface. The floc growth and breakage studies also confirmed the flocculation potential of produced biopolymer. This work suggest that cationic xylan (biopolymer) can serves as an effective flocculant in removal of clay wastes present in waste water of various industries.

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