Synthesis of bacterial cellulose-montmorillonite composites with enhanced mechanical and thermal properties

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The polymers composite with solid clay particles is receiving a huge concern, because the nanoclays can strengthen the physico-mechanical properties of the polymer. Montmorillonite (MMT) is the most widely used clay in preparing polymer composites. Bacterial cellulose (BC) has a great potential to be used as a polymer matrix for composites preparation due to its high compatibility and porous fibrous structure. In the present study, the BC-MMT composites were synthesized using a simple impregnation approach by treating BC sheets with various concentrations of MMT suspension. The MMT adsorbed on BC surface and also penetrated into the BC matrix as confirmed from FE-SEM analysis. The mechanical and thermal properties of BC-MMT composites were significantly improved compared to pure BC. The tensile strength of the composite reached to 210 MPa for 2% MMT compared to the 151 MPa for pure BC. Similarly the Young's modulus values were also higher for all composites compared to pristine BC. The degradation temperature for BC-MMT (4%) composite reached till 310°C compared to 232°C for pure BC.