Performance of kapok fiber reinforced polyvinyl alcohol bicomposite by alkali treated

ABSTRACT

Raw Kapok (Ceiba pentandra) fibre was initially washed and dried before undergoes chemical treatment. Upon dried, the kapok fibre was bleached and delignified at room temperature, in an acidic solution containing 6% of sulphuric acid and 4% hydrogen peroxide to remove hemicellulose and wax. The treated kapok was filtered and washed thoroughly with distilled water and vacuum dried at 60 oC for 10 hours. Finally, the treated kapok was converted to alpha-cellulose (α-cellulose) by alkali treatment. In this step, treated kapok was immersed in 17.5% of sodium hydroxide solution for 30 minutes at a temperature of 50 oC to remove alkali-soluble components. The obtained α-cellulose, termed as alkali treated kapok fiber (AKTF) was filtered, washed thoroughly with distilled water until pH is neutral and vacuum dried at 60 oC for 10 hours. In this stage, a certain weight of ATKF (0%, 10%, 20%, 30%, and 40%) were mixed with a hot solution of PVA and dried at room temperature. In the mechanical test, ATKF – PVA biocomposite shows an increase in tensile strength and elastic modulus up to 30% content of kapok fibre but drop at 40% kapok loading. The result shows that both ATKF – PVA biocomposite film (30%) were having the highest mechanical properties among the others and was chosen for next characterizations. It is evidence in FTIR spectra that the composites indicate the formation of new hydrogen interaction between kapok fibre and PVA which might help to improve the mechanical properties. As for XRD analysis, the ATKF – PVA biocomposite film (30%) blend was found to be a heterogeneous as the peaks of diffractogram were overlap each other. This is supported by SEM micrograph in which ATKF – PVA biocomposite (30%) show a heterogeneous phase. Additionally, in the TGA data, ATKF – PVA biocomposite (30%) was founded less thermally stable than raw kapok and pure PVA is the least thermally stable among other samples.