THERMAL STABILITY OF DIFFERENTLY TREATED NATURAL FIBER REINFORCEMENTS FOR COMPOSITES

A.Grozdanov\textsuperscript{1}, G.Bogoeva-Gaceva\textsuperscript{1}, A.Buzarovska\textsuperscript{1}, M.Avella\textsuperscript{2}, G.Gentile\textsuperscript{2}, A.Dekanski\textsuperscript{3}

\textsuperscript{1}Faculty of Technology and metallurgy, R.Boskovic 16, 1000 Skopje, R.Macedonia
\textsuperscript{2}Institute for Chemistry and Technology of Polymers - CNR, Via Campi Flegrei 34, 80078 Pozzuoli, (NA) Italy
\textsuperscript{3}IHTM, University of Belgrade, Njegoseva 12, 11000 Belgrade, Serbia and Montenegro

Recently, the incorporation of natural lignocellulosic materials as reinforcements or as fillers in polymer composites has received an increased attention. The addition of natural fibers has a high impact upon economics for thermoplastics, while a general improvement in certain properties is also achieved. Natural fibers (NF) exhibit a number of attractive features such as low density, non toxic, no abrasion during processing, abundance of renewable resources and ceratinly biodegradability. In order to improve the incorporation of natural fibers into polymers and to promote higher fiber/matrix interfacial adhesion, NF can be modified by different chemical and physical treatments. Due to the chemical treatment, the cell wall hydroxyl groups are substitute rendering the NF surface more hydrophobic, and thus more compatible to the polymer matrix. For NF used as a filler or reinforcement in polymer composites, the thermal stability is of paramount importance. The manufacturing of composites requires mixing of fibers/fillers and matrix at high temperature, well above the melting temperature of the matrix. A prolonged exposure of the NF at such high temperature raises the question about potential degradation and thermal stability of the fillers.

This work review the effects of several chemical treatments (dewaxing, alkali treatment, acetylation, cyanoethylation) performed on NF reinforcements (kenaf, juta, sisal, cotton) on the properties like thermal stability, crystallinity and surface morphology. The effects resulted from the performed modification were analyzed by TGA, FTIR and SEM. Using the Flynn and Wall expression, the activation energy of the thermal decomposition of the treated NF was calculated. The SEM photographs have shown that during the chemical treatment of NF, the surface morphology changes as well as changes in the crystalline structure of cellulose proceed, as shown earlier \cite{1}. FTIR band changes and their shifts due to the chemical treatment are most evident for alkali treated and acetylated NF. TGA have shown that fiber thermal stability is directly related to the type of the reagent used for the treatment. It was found that $E_a$ of kenaf fiber increased with chemical treatment of the fibers ($E_{a\text{row}}=48,9 \text{ kJ/mol}$, $E_{a\text{acet.}}=54,4 \text{ kJ/mol}$, $E_{a\text{alk.}}=92,4 \text{ kJ/mol}$).

References
