SEM Analysis of Untreated and Treated Sisal Fibers

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Abstract- Differential Scanning Calorimetry (DSC), Wide Angle X-ray Diffraction (WAXRD), Fourier Transform Infra-Red Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) have been used to study the thermal characteristics, crystallinity index, reactivity and surface morphology of untreated and chemically modified fibres. The technical textiles deal with the chemical composition, morphological fibre characteristics, physical plant characteristics and mechanical properties of various types of natural fibres. In this paper SEM (Scanning Electron Microscopy) analysis of untreated and treated sisal fibres has been investigated.

Indexed Terms- Scanning Electron Microscopy (SEM), of untreated and treated sisal fibres.

I. INTRODUCTION

Scanning Electron Microscopy (SEM) is a test process that scans a sample with an electron beam to produce a magnified image for analysis. The method is also known as SEM analysis and SEM microscopy, and is used very effectively in microanalysis and failure analysis of solid inorganic materials.

II. SEM ANALYSIS OF UNTREATED AND TREATED SISAL FIBRES

Figures 1(a) (b) (c) to 4 (a) (b) (c) show scanning electron micrographs of untreated and treated sisal fibres with sodium hydroxide with different concentrations and duration of treatment. In untreated sisal fibre, the presence of some impurities and waxes can be seen. In figures the below naming are used.

(a) – Untreated Sisal Fibre
(b) – 5% NaOH treated for 1 hour at room temperature
(c) - 10% NaOH treated for 10 minutes at room temperature

Different magnification also used in this study. The levels are 500,1000,2000 and 4000 respectively.

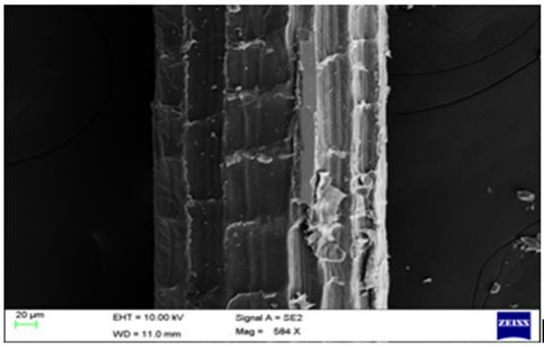

Figure 1 (a) – Untreated sisal fibre

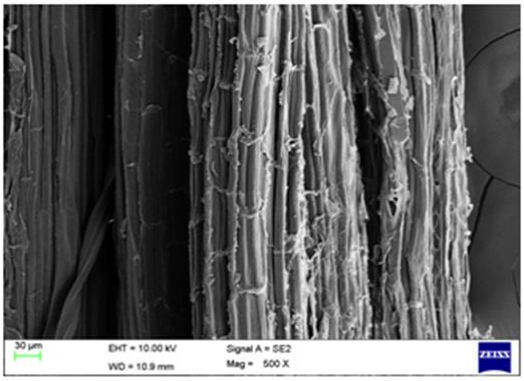

Figure 1 (b) 5% NaOH Treated for 1 hour at room temperature

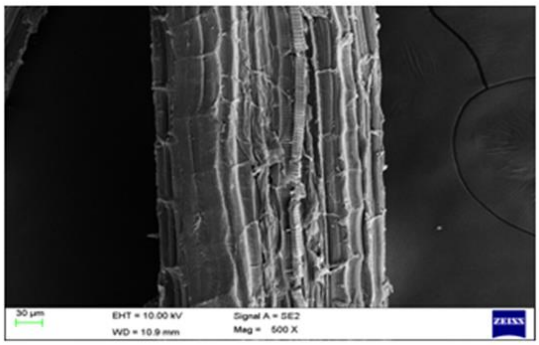

Figure 1 (c) 10% NaOH Treated for 10min at room temperature

Figures 1 (a) (b) (c) SEM micrographs of untreated and treated sisal fibre at 500 magnification(scale bar = 20µm)

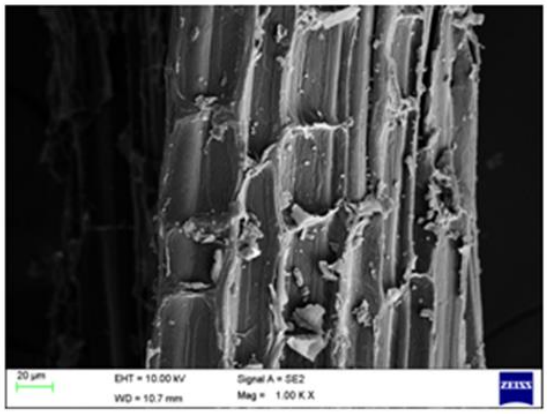

Figure 2 (a) – Untreated sisal fibre

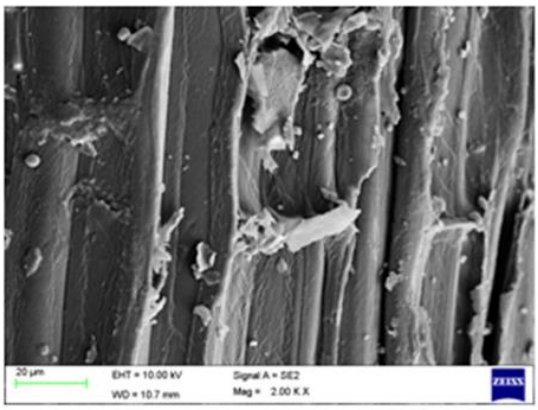

Figure 3 (a) – Untreated sisal fibre

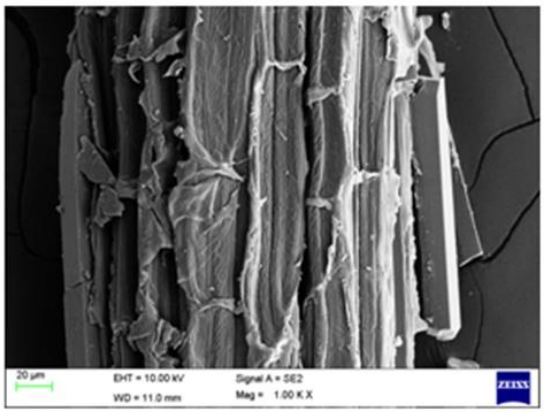

Figure 2 (b) 5% NaOH Treated for 1 hour at room temperature

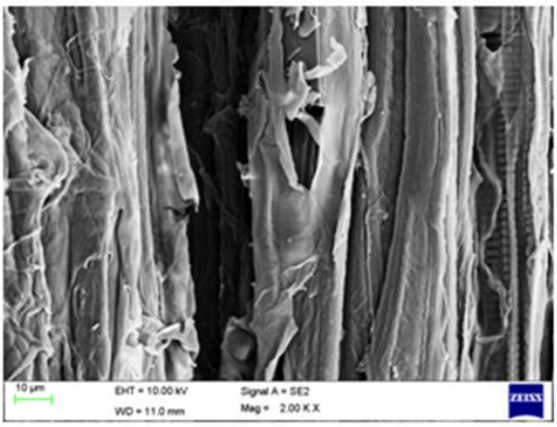

Figure 3 (b) 5% NaOH Treated for 1 hour at room temperature

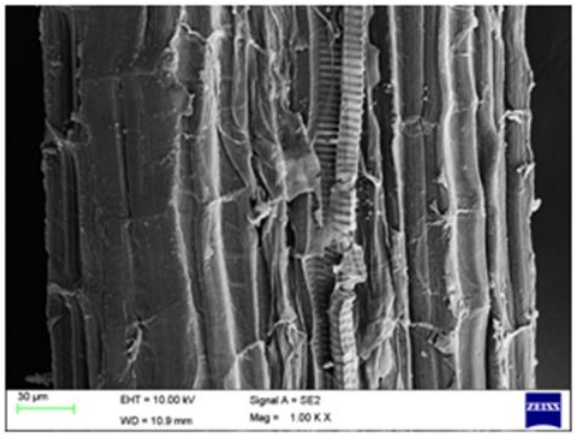

Figure 2 (c) 10% NaOH Treated for 10min at room temperature

Figures 2 (a) (b) (c) SEM micrographs of untreated and treated sisal fibre at 1000 magnification (scale bar = 20µm)

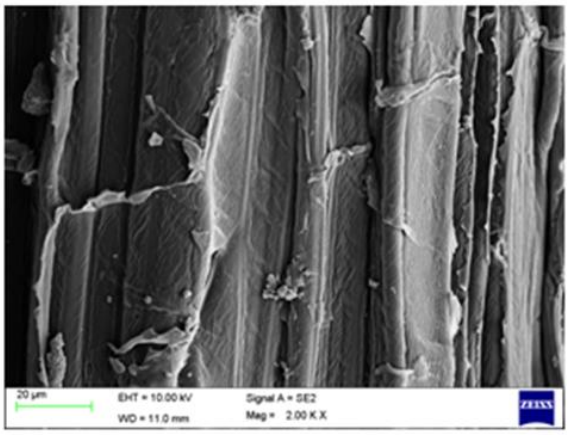

Figure 3 (c) 10% NaOH Treated for 10min at room temperature

Figures 3 (a) (b) (c) SEM micrographs of untreated and treated sisal fibre at 2000 magnification(scale bar = 20µm)

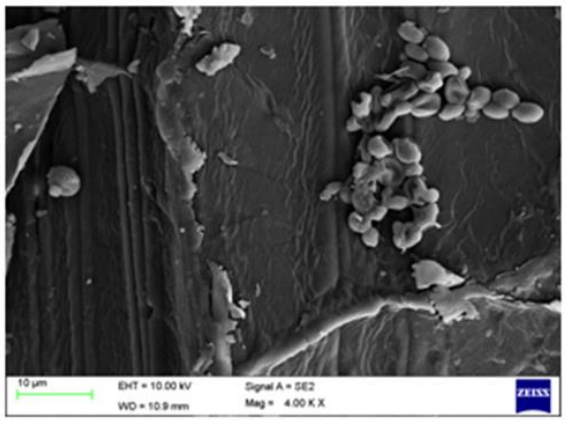

Figure 4 (a) – Untreated sisal fibre

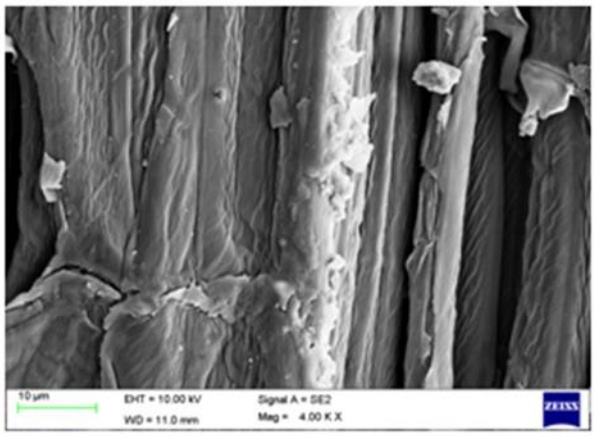

Figure 4 (b) 5% NaOH Treated for 1 hour at room temperature

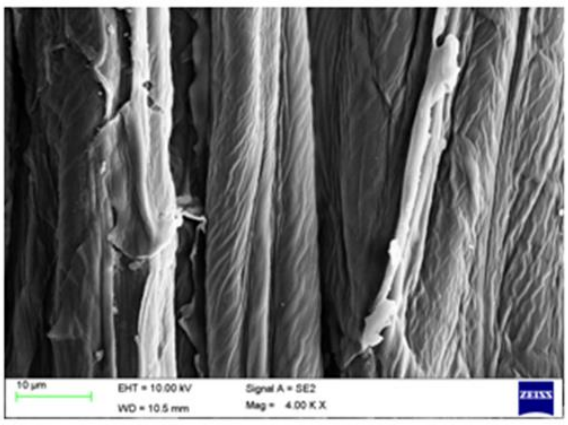

Figure 4 (c) 10% NaOH Treated for 10min at room temperature

Figures 4 (a) (b) (c) SEM micrographs of untreated and treated sisal fibre at 4000 magnification (scale bar = 20µm)

The removal of some natural and artificial impurities of the sisal fibres by the alkali treatment is noticed in Figures 1 (b) (c) to 4(b) (c). It has been found that alkali treatment leads to fibrillation or fibre separation process i.e., breakdown of the bundles of the fibre composites into smaller fibres. The surfaces show a significant difference following alkali treatment. The removal of surface impurities and the separation of the ultimate cells due to extraction of the cementing components such as lignin and hemicellulose were observed following alkali treatment. The dissolution of waxy materials increased the inter fibrillar region and yielded a surface with a rougher texture. Other substances associated with the cellulose (i.e., non-cellulosic, mono saccharide fatty substances) and inorganic components were also removed (Martin *et al.2004*, Botaro*et al. 2010*).

CONCLUSION

The scanning electron micrographs show the removal of impurities and the other substances following alkali treatment. The presence of fibrillar structure is noticed in alkali treated sisal fibre.

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