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A STUDY ON TRIBOLOGICAL PROPERTIES & MOISTURE ABSORPTION OF VARIOUS POLYMER COMPOSITES MADE OUT OF VARIOUS NATURAL FIBERS & FILLER MATERIALS: A Review

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Abstract - *The main aim of this work is to estimate and understand the effect of different natural fibers and filler materials that are used in fabrication of polymer composite material. The work is to analyze the experimentally verified results with different properties like tribological behavior and moisture absorption. In this work different polymer composites are prepared with natural fibers like Jute, Bamboo fibers, Hemp, Sisal, Coir, Rice husk, Sugar cane bagasse, Kneaf, Flax etc. and filler materials like Sic, Fly ash, WC, Alumina, Silicon oxide etc. Hence an attempt is made to compare and analyze some of these experiments.*

Keywords: Polymer composite materials, Natural fibers and filler materials.

1. INTRODUCTION

Now a days researchers showing interest on the polymer composite materials because of less weight, low cost, easy to fabricate compared to monolithic materials. The composite materials are fabricated based on the matrix, reinforcement and fillers. The matrix are of 3 types, they are polymer matrix composites, metal matrix composites, ceramic matrix composites. Polymer composite materials fabrication is based on the reinforcement and matrix materials. Natural fibers and synthetic fibers are the reinforcement materials for the polymer composite materials. Natural fibers are used as reinforcement in PMC. Reinforcing materials gives the strength and stiffness of the composite materials.

1.1 Fibers

Natural fibers and synthetic fibers are the two types of fiber reinforcement materials for the polymer composite materials. Naturally available fibers are called as natural fibers. The different polymer composite are prepared with natural fibers like Jute, Hemp, Kneaf, Coir, Rice husk, Bamboo, sisal etc. The utilization of natural fibers for the fabrication of polymer composite materials because abundantly available in nature, less cost, less weight and gives better strength and stiffness of the composite material.

1.2 Fillers

Natural fibers and filler materials reinforcement of polymer composite materials. The filler materials used to enhance the strength of polymer composite materials. Filler materials that are used to increase the strength and reduce the fabrication cost of composite materials. The filler materials like Sic, Fly ash, WC, Alumina, Silicon oxide etc. that are used to increase the mechanical properties of composite materials.

2. LETERATURE SURVEY

Emadi Omarani et al, in this experimental work is to study the tribological behavior of the reinforced polymer composite materials. And the effect of moisture content present in the natural fibers which will affect on the tribological behavior of polymer composite materials. The work conclude that the moisture content natural fibers have higher material loss comparatively chemical treated materials [1]. T. Madhusudhan et al, in this investigation carried out on the tribological behavior on Hybrid polymer composite materials. On this study of filler material sic is used for the hybrid polymer composite like Glass-Jute-Epoxy, Glass –Sisal-Epoxy and Glass-Rubber-Epoxy composites with different weight percentage of silicon carbide filler material to analyse the tribological behavior of composite materials. The work conclude that the unfilled hybrid polymer composites have high material loss compared to the sic filled hybrid polymer composite materials [2]. Temesgen Berhanu Yallew et al, in this investigation on tribological behavior on jute reinforcement of polypropylene composite material. In this investigation the effect of Jute fiber reinforcement on the resulting composites behavior under friction. The wear behavior of composite material was analyzed based on the different working parameters like speed, load, and sliding distance. Based on the wear behavior the SEM has been utilized to support the discussion of outcomes [3]. T. Madhusudhan et al, in investigation of work to study the tribological behavior of polymer composite materials. Two body abrasive wear test carried out at different loading and abrading distance for hybrid polymer composite materials. The test to be conducted by using pin-on-disc wear testing apparatus is used to find the surface hardness and strength and stiffness of sic filled Glass fiber reinforced with epoxy resin hybrid composites. The addition of filler material sic to the hybrid composite material will decrease the wear rate and increase abrading distance. [4]. Layth Mohammed et al, in paper the affect of chemical treatment for the natural fibers reinforcement of polymer composite materials. The moisture absorption properties of natural fibers can be

SEM analyzed results for JUTE + Polypropylene.

According tribological behavior of jute/polypropylene composite materials. SEM Micrographs of worn Jute/ PP composite specimen at different load &sliding distance. a)10N and 3m/s; b)20N and 2m/s; c) 30N and 1m/s.

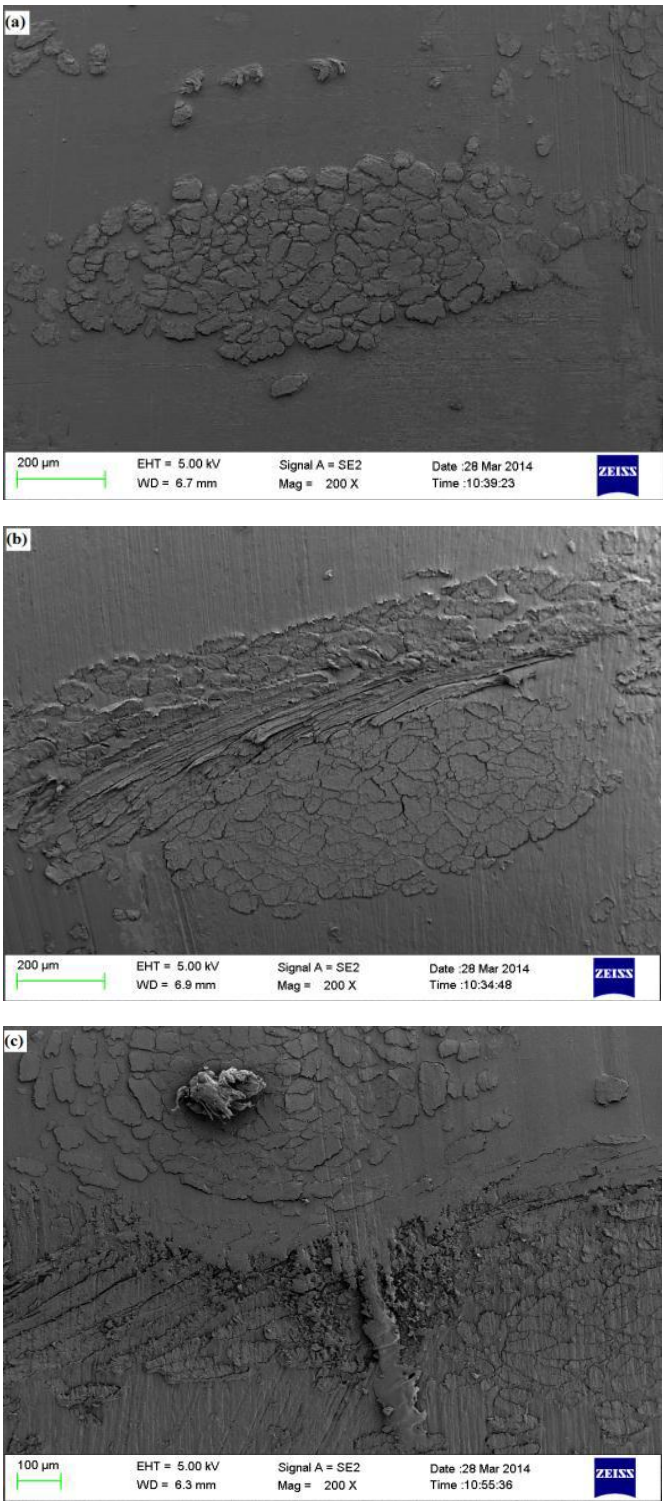

Fig 3. SEM Micrograph of worn Jute/ PP composite specimen at a)10N and 3m/s; b)20N and 2m/s; c) 30N and 1m/s.

- According tribological behavior of sisal/polysulfide – modified epoxy composite materials. Tribological properties of sisal reinforced composites under different orientation of natural fibers in the composite. The specific wear rate with constant load 7N and sliding speed of 2.5 m/min for sisal fiber under different orientations reinforced polysulfide- modified epoxy.

Combination	Fiber orientation	Wear rate (mm^3/ $Nm*10^{-13}$)
Sisal + polysulfide-modified Epoxy	Normal	0.4
	Parallel	1.3
	Anti-Parallel	0.6

Table. 3. The wear rate for sisal/polysulfide –modified epoxy composite materials under different orientation.

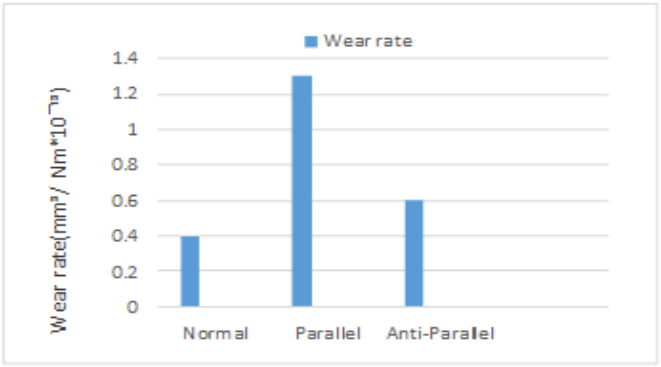

Fig.4. wear rate v/s load results for sisal/polysulfide – modified epoxy composite materials under different orientation

SEM analyzed results for sisal and polysulfide-modified epoxy composite

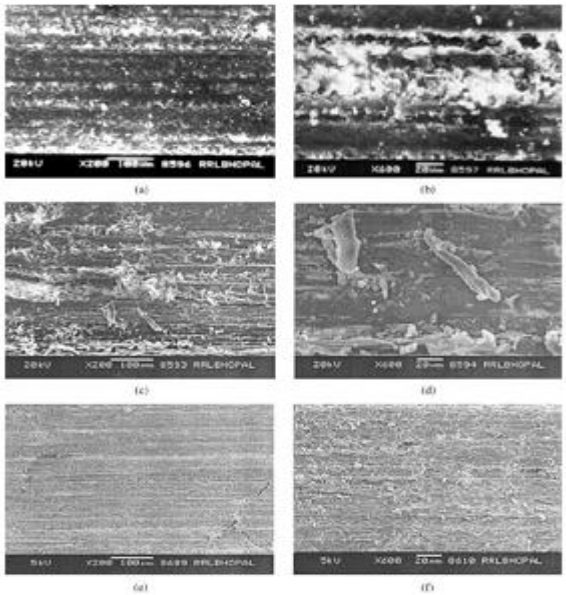

Fig. 5. SEM micrographs of worn surface of different composites:

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