

**BUSITEMA
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Pursuing Excellence



FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

**MANUFACTURE OF A BARKCLOTH
REINFORCED BIOCOMPOSITE**

BY

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**FOURTH YEAR PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT FOR
THE AWARD OF A BACHELOR OF SCIENCE DEGREE IN TEXTILE
ENGINEERING**

DECLARATION

I **Luggya George William** declare that this report is an original compilation that accrued from personal effort through implementation, literature, consultations with my supervisors and course-mates. It has therefore never been submitted to any academic institution for consideration.

 27/05/2013

Luggya George William, May 2013



APPROVAL

This report has been submitted for examination after scrutiny and approval from my supervisors.

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Firstly, thanks are all owed to the almighty God who has always enabled me go through thin and thick despite of several bottlenecks but all in all have always emerged a victor.

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ABSTRACT

In the latest years industry is attempting to decrease the dependence on petroleum based fuels and products due to the increased environmental consciousness. This is leading to the need to investigate environmentally friendly, sustainable materials with more sustainable methods of manufacture and reduced energy consumption supporting a desire for lighter-weight structures to replace existing ones (Paul A Fowler *et al*, 2006). The industry has therefore resorted to the use of natural fibers to replace unsustainable glass fibres and other synthetics in composites producing what are commonly referred to as bio-composites for both technical and nontechnical applications.

Bio-composites are composite materials comprising one or more phase(s) derived from a biological origin. In terms of the reinforcement, this could include plant fibres such as cotton, flax, hemp and the like, or fibers from recycled wood or waste paper, or even by-products from food crops. Regenerated cellulose fibers (viscose/rayon) are also included in this definition (Paul A Fowler *et al*, 2006).

Barkcloth a unique non-woven textile made from the naturally re-growing bark of ficus natalensis fig-tree that is native to Uganda, can potentially be used in the production of bio-composites. Its use in the country has always been limited to cultural ceremonies, wrapping of the dead and other traditional practices which have made it unpopular. The use the cloth in bio-composites will give a hand to UNESCO's effort to revitalize bark cloth making. This cloth is said to have originated from South China entering East Africa via Madagascar (Rod Ewins, 1987).

Bio-composites are commonly manufactured using techniques including hot pressing, hand laminating, resin techniques, compression moulding. Of all the techniques hand laminating is the cheapest, very flexible, requires little expertise and easy to use thus practically feasible in developing countries. Furthermore, this technique is very suitable for the production of natural fiber reinforced composites.

In this research, the barkcloth/epoxy composite manufactured was tested for flexure and tensile properties. The composite exhibited very promising mechanical properties with an average tensile strength of 17.045Mpa which calls for more research into its use in car dashboards, dashkits and furnishings. The obtained flexure strength was 34.93N/mm² portraying a relatively low ability to bear compressional loads.

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CHAPTER I

INTRODUCTION

1.1 Background

Bark Cloth is a unique non-woven textile made from the naturally re-growing bark of the fig-tree (*ficus natalensis*). It is an ancient material with a history dating back thousands of years.

The world's first search for the origins of barkcloth clothes from an archaeological perspective recently pointed out that the world's barkcloth culture might have originated in South China. Before weaving technology was invented, barkcloth garments were prevalent in South China. The world's oldest barkcloth clothes making tool—the stone beater, which dated back to 6,600 years ago, was unearthed in the Xiantouling site of Shenzhen. Barkcloth technology was spread to the Philippines, Taiwan and even Central America — via the sea route which has a longer history than the Silk Road. Bark cloth in this case was majorly produced from paper mulberry from the moraceae family of plants the same family the *ficus natalensis* species of East Africa belongs ([bark cloth china.html](#)). The bark cloth of Africa may well have entered via Madagascar, which was settled by people who voyaged there from somewhere in Southeast Asia, and spoke a language we call Austronesian (Rod Ewins, 1987).

In East Africa, the bark of *Ficus natalensis* fig tree has for centuries been harvested to produce the bark cloth. The bark consists of Cellulose fibers and a very small amount of Tannin. According to UNESCO, the production of bark cloth originates from Uganda where this fig tree species is indigenous, locally known as mutuba tree and is presumably the world's oldest non-woven textile.

According to world history, bark cloth has been produced in the Buganda Kingdom, and used commercially, ritually and ceremonially by the Baganda, an ethnic group found in central Uganda since the 13th century thus considered to be the pioneers in bark cloth development and production although it is also been produced and used in other areas of Uganda, especially in the Kingdoms of Bunyoro, Busoga and Tooro. The best natal fig trees are grown about 150

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