

BAMBOO: Versatile Material for Polymer Composites

By: Mohammad Jawaid (PhD)

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Bamboo is one of the agricultural crops grown in various continents of the world. Bamboo has 7-10 subfamilies of genres and there are 1575 difference species ranging from the type of wood to bamboo herb. It reported that Malaysia has approximately 70 species of bamboo in which 50% in Peninsular Malaysia, 30% in Sabah and 20% in Sarawak (Wong, 1989). The 10 available genera of bamboo are Bambusa, Dinochloa, Yushania, Chusquea, Gigantochloa, Phyllostachys, Dendrocalamus, Racemobambos, Thyrsostachys and Schizostachyu (Wong, 1989; Azmy and Abd. Razak, 1991). Bamboo is easily accessible globally, 64% of bamboo plantation originated from Southeast Asia, 33% grown in South America, and the rest comes from Africa and Oceania (Bonilla, et al. 2010). Fig. 1 display bamboo plantation in

Malaysia. Bamboo known by different names in Asian countries, “friend of people” (China), “wood of the poor” (India), and “the brother” (Vietnam) (Waite, 2009; Farelly, 1984). FAO provided the data of bamboo production at global level as shown in Fig. 2. Bamboo mainly dominated in six Asian Countries viz. India, China, Indonesia, Philippines, Myanmar, Vietnam (Lobovikova et al., 2007). Asian Countries such as Malaysia unable to explore it fully for design and development of engineering materials such as polymer composites. Utilization of Bamboo as sustainable material for polymer composites will improve socio-economic condition of farmer growing and harvesting bamboo. Bamboo considered one of the potential natural fibres to be used in polymer composite industry. Due to unique properties made it versatile for the use in composite industry (Kitagawa et al., 2005; Amada et al., 1997).

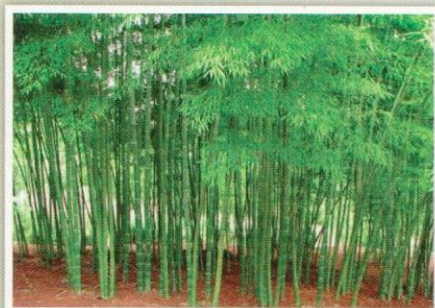


Fig. 1. Bamboo Plantation in Malaysia (<http://bamboogardenmalaysia.blogspot.com/>)

Bamboo Fibres

Bamboo has elevated mechanical strength, low specific weight ratio, high tensile strength and better modulus of elasticity than other natural fibre (Sen and Reddy, 2011). Beside that advantages bamboo uses are limited due to bad torsion when it become mature and probability of decomposition in biological attack. The chemical composition of bamboo fibre constitutes mainly cellulose, hemicelluloses and lignin (Jawaid and Khalil, 2011). These components are actually same high-glycans, and make about 90% of total weight of bamboo fibre (Abdul Khalil et al., 2012). Among the various lignocellulosic fibers, bamboo has a high percentage of lignin (32%) and its microfibrillar angle is relatively small (20–100) (Liu et al., 2012). These factors lead to the extremely high tensile strength, flexural strength, and rigidity of the fibres polylamellate wall structure (Liu et al., 2012). Based on its anatomical properties, ultra structure and

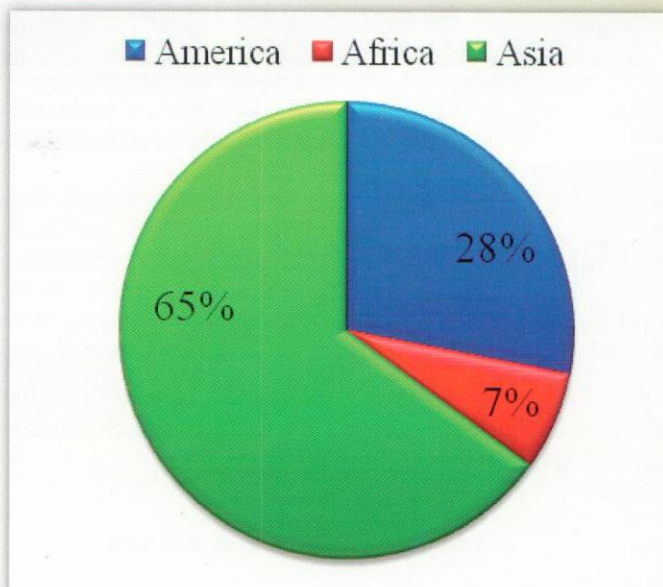


Fig. 2. World percentage of bamboo from different continents (Lobovikov et al., 2007)

Bamboo fibers has a relatively high strength, narrow microfibril angle, and low cost although it has the disadvantages of high moisture sensitivity and variation in fibres properties can be used effectively as reinforcement in fabrication of bamboo fibre based composites. Utilization of bamboo fibre with polymeric materials helps to develop cost effective and eco friendly bio composites which directly affect the socio-economic condition of farmers who are cultivating bamboo.



Fig.4. Furniture application of bamboo fibre based composites Source: www.ipirti.gov.in, www.bamboocomposites.com, Accessed on April 18, 2013.

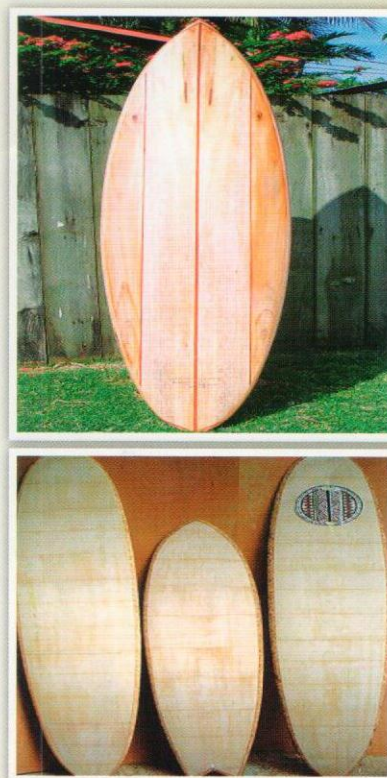


Fig. 5. Water sports decks from bamboo fibre based composite source: www.bamboosurfboardshawaii.com/surfboards.html, Accessed on April 18, 2012.

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Research Fellow

Laboratory of Biocomposite and Technology
Institute of Tropical Forestry and Forest Products (INTROP)