Bio products innovations: on the way

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INTRODUCTION

In recent years, an increased debate and interest in green product innovation was clearly observed. Green product innovation is increasingly being portrayed as an opportunity; while some also considers it as a win-win logic of being 'green and competitive'. Examples of success stories are the Body Shop's range of cosmetic products and Toyota's hybrid car. Nevertheless, the debate on what is sustainable or what compose a green product is still on-going (Lin, Tan et al. 2013). However, Hall and Vredenburg (Hall and Vredenburg 2003) argue that sustainable product innovation in these companies are either public policy induced or is market-driven.

MARKETING OF BIOPRODUCTS

According to many researchers (Carrillo-Hermosilla, Del Río et al. 2010, Horbach, Rammer et al. 2012), environmentally sustainable product innovation depends on consumers willing and able to acquire such innovations, environmental-friendly legislation, government incentives, and educational campaigns that disseminate sustainable culture among society. When market realizes that organizational practices minimize negative environmental impact, companies tend to obtain benefits related to cost and differentiation. In a similar research says, environmental certification positively influences adoption of green innovation. Environmentally sustainable practices add value to a brand as they generate positive awareness towards the brand, as well as increased perceive quality and trust that may positively impact customer satisfaction (De Medeiros, Ribeiro et al. 2014).

NATURAL FIBRE BASED BIO PRODUCTS

Natural fiber-based polymer composites offer various noteworthy advantages over conventional synthetic ones in terms of biodegradability, eco-friendliness, cost, availability, low density, and so forth (Majeed, Jawaid et al. 2013). Natural fiber reinforced polymer composites are gaining more and more recognition and further acceptance in food packaging, in automobile, railway coach and aero-plane interiors, as well as in storage devices, in building and structural applications. A number of bio-based natural polymers are being explored and studied for diverse applications (Siakeng, Jawaid et al.) shown in figure 1.

Figure 1- Natural fibre based some products

Extensive research and development activities have resulted in considerable interest in exploring new materials based on biodegradable polymers. As is well known, the application of polymer composites can be greatly affected by the composition of the blending deferent types of polymers with natural fibres and can vary based on the end use requirements.

APPLICATIONS OF BIOPRODUCTS

As the demand for eco-friendly and renewable materials continues to rise. Biopolymer based composites are receiving increasing attention and biopolymer blends based materials have found major green applications (Nampoothiri, Nair et al. 2010, Armentano, Bitinis et al. 2013). Even though these biopolymers products are emerging as alternatives to existing non-renewable fossil fuel-based plastics, the current low-level production and high price limit their extensive applications. However, the demand for bioproducts have been amplified during the past decade due to their improved applications and environmental concerns (Faruk, Bledzki et al. 2014). Bioproducts have been widely used in various areas such as packaging, medical, upholstery, textile and automotive interiors, due to its light weight, good biocompatibility, biodegradability and some mechanical properties (Saba, Jawaid et al. 2017). The simplest and most eco-friendly way to improve the mechanical and thermal properties of biopolymers is the addition of natural fibers or filler materials. Both synthetic and natural fibers, as well as nanoparticles are used as reinforcement in

biopolymer-based composites to improve their overall properties (Sawpan, Pickering et al. 2011, Nassiopoulos and Njuguna 2015). The application of bioproducts has been extended to other commodity areas, especially in the composite industry, ever since its production cost has been lowered by new technologies (Rose and Palkovits 2011). Natural fiber/PLA composites are being widely used in a wide range of applications such as packaging, medicines, textiles, automobiles, industrial, infrastructure, building, furniture, and other commercial markets as listed before. Various automobile parts, for example, dashboards, door panels, package trays, headliners and some interior parts, are being developed using these natural fiber-based biopolymers (Jia, Gong et al. 2014). Industrial markets for bioproducts are likely to increase considerably in the future. Some of the uses of PLA are showcased in Figure 2.

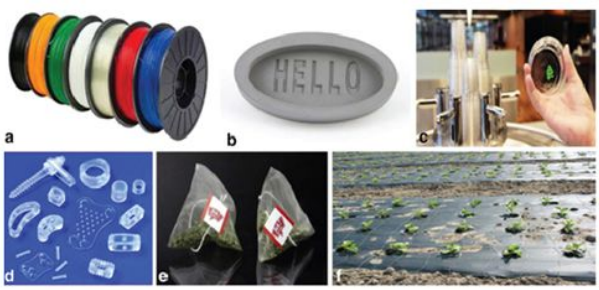

Figure 2- Different types of bioproducts (Siakeng, Jawaid et al.)

PROSPECTS OF BIOPRODUCTS

Increasing demands for renewable and recyclable materials, the alarming energy crisis, environmental regulations, and public concerns about plastic dumps and pollution have spurred efforts to develop biodegradable materials. natural fibers and biopolymers offer a potential alternative to the conventional fibers and synthetic polymers, which are difficult to recycle and not sustainable.

Future development trends in bioproducts are as follows: first, low-cost production, which can win general acceptance. Considering market demands, mass production of biocomposites and increasing development of cheaper biopolymers, the cost will probably decrease. Second, current and future research should examine the fabrication and improvement of biopolymers-based composites with different types, ratios, and forms of natural fibers for multifunctional applications. Finally, a proper database should be prepared on fibers and biocomposites due to the complex and diverse nature of natural fibers.

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