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Rigid Polyurethane Insulation Foams Made from Lignocellulosic Rice Straw

GRANTEE: Mindanao State University-Iligan
Institute of Technology (MSU-IIT)

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US UNIVERSITY PARTNER : University of Missouri (UM)

GRANT PERIOD: September 1, 2016 to August 31, 2017

CONTRACT AMOUNT : Php 5,949,758.12 (approximately USD127,000)

Sustainable polyol production

The global market of polyurethane (PU) products for commercial and industrial fields is expected to reach USD77 billion by 2020 according to Grand View Research (2014), with Asia Pacific being the largest potential market. This increase in demand of PU is a significant concern since its thermosetting properties make recycling PU more difficult. Likewise, with the utilization of petroleum in polyols production, pollutants such as: greenhouse gases, carbon monoxide, and volatile organic compounds are expected to rise and pose health and environmental concerns.

As a solution to this dilemma, MSU-IIT, with support from USAID STRIDE and in collaboration with UM, proposed the use of alternative sustainable and biodegradable raw materials. Vegetable oils and lignocellulosic are two options; however, since vegetable oils are also in demand as food products, lignocellulosic material is the preferred alternative for polyol production. Lignocellulosic materials are plant materials made up of cellulose, lignin, and hemicellulose. These are waste that remain after harvesting crops like rice straw, soybean straw, corn stover, and wood chips.



A member of the research team trains at the University of Missouri

Going green



Antioxidant extraction for the Azino-bis 3-ethylbenzothiazoline-6-sulphonic acid (ABTS) assay

In the Philippines, rice straw, composed of 36% cellulose, 24% hemicellulose, and 15.6% lignin, is an abundant lignocellulosic biomass. Its lignocellulosic component makes it rich in hydroxyl, a vital component for polyol production. The polyol produced from waste rice straw and by-product crude glycerol will be used to produce bio-based rigid PU foams for possible insulation applications. The project hopes to make a product in spray form that can be commercially used as insulation material in industrial and residential areas.

A very important objective of the project is to address environmental concerns regarding polyols, which are traditionally produced from petroleum sources. Moving towards lignocellulosic biomass will lead to a more sustainable and environment-friendly manufacturing process. More than that, recycling and disposal activities will become easier for end-consumers. The use of waste rice straw will not only help mitigate global warming, but it will also generate additional income for local farmers. The PU industry and local farmers will work hand-in-hand to help reduce solid waste. Furthermore, using crude glycerol provides additional income for biodiesel companies, while helping them make use of the byproducts generated.