FATTY ACID-BASED POLYOL

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With soaring petroleum prices, polyols from vegetable oils are increasingly viable alternatives to petroleum polyols. MPOB has developed a palm-based polyol for the polyurethane (PU) industry, which consumes 4.5 million tonnes worldwide annually.

The polyol is produced from palm fatty acids, and can be made into PU coating, adhesives, sealants and elastomers. The fatty acids used as raw material is a by-product from the oleochemicals industry - palm kernel oil after removal of lauric and myristic acids for the production of surfactants. The by-product mainly contains oleic acid with small amounts of other fatty acids, like linoleic, and fetches a low price.

Another raw material is glycerol, which is another co-product from the oleochemical. The price of glycerol have been greatly affected by development of biodiesel industry. In order to safeguard the interest of glycerol, a lot of work have been done to diversify the usage of glycerol by converting it into other useful chemicals and one of the value-added products is polyol. This article describes the use of palm fatty acids and glycerol to make polyol.

PREPARATION OF FATTY ACID-BASED POLYOL

The polyol is produced by esterification, epoxidation and alcoholysis. The process is shown in *Figure 1*.

PROPERTIES OF FATTY ACID-BASED POLYOL

The typical properties of fatty acid-based polyol are shown in *Table 1*. It is light in colour (*Figure 2*), and therefore suitable for coatings and adhesives which are required to be transparent or white. In addition, it has quite a high hydroxyl value of

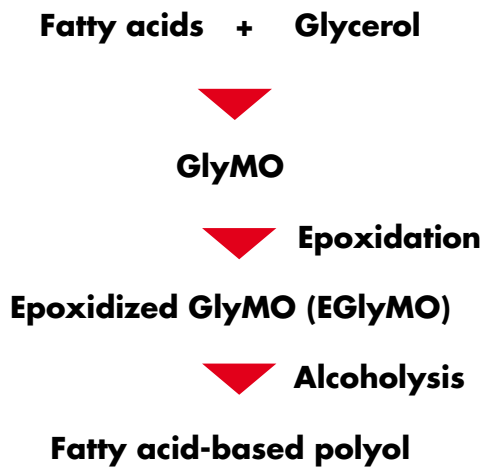

Figure 1. Process for preparing fatty acid-based polyol.

Figure 2. Fatty acid-based polyol.

240 mg KOH g^{-1}, making it suitable for 2K PU adhesives and coatings.

ADVANTAGES OF FATTY ACID-BASED POLYOL

- Fatty acid-based polyol could be prepared from by-products of oleochemical industry, which add value to these products;
- Fatty acid-based polyol has suitable properties

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TABLE 1. TYPICAL PROPERTIES OF FATTY ACID-BASED POLYOL

Property	Values
Hydroxyl value (mg KOH g^{-1})	220 - 240
Acid value (mg KOH g^{-1})	1 - 3
Iodine value (g I_2/ 100 g)	40 - 45
Moisture content (%)	0.1 - 0.3
Lovibond tintometer (L,a,b)	0.3 L, 0.2 a, 1.5 b
Viscosity at 25°C (cP)	1 000 - 1 500

for PU CASE with its light colour and high hydroxyl value; and

- PU products made from fatty acid-based polyol are more environmental friendly than current materials used in the industry.

MARKET SIZE

The global market for PU CASE products is estimated to be two million tonnes, with the demand for polyol at one million tonnes. The local market for PU CASE is about 16 000 t, and the polyol demand about 8000 t.

ECONOMIC ANALYSIS

Return on investment = 40%.
Payback period = 2.5 years.

CONCLUSION

The production of fatty acid-based polyol uses low cost by-products from the palm oil industry. The fatty acid-based polyol is an attractive alternative to petroleum polyols, and has advantageous properties for the PU CASE industry. The product is currently being tested by some local companies.

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