

PALM-BASED POLYOL FOR ADHESIVES

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RESEARCH ON PALM-BASED POLYOLS IN MPOB

There are several types of polyols that can be produced by the MPOB pilot plant (capacity 800 kg per batch). The polyols are obtained by reacting epoxidized palm oil with a short-chain alcohols such as glycerol or ethylene glycol. These polyols can then be reacted with suitable isocyanates to give a variety of polyurethane (PU) products. The PU products can be rigid, semi-rigid or flexible and are suitable for industrial sectors like building, furniture and automotive parts. To date, MPOB has produced products like ceiling panels, sandwiched boards for wall panel, dry flora foam, thermal insulator for freezer and flexible soft foam for furniture and others.

One of these palm-based polyols, polyol from palm oil and ethylene glycol (PolyEG) when blended with PolyMO (see MPOB TT No. 278 for more information on PolyMO), a new natural polyol from palm oil, is found suitable for adhesive applications.

ADHESIVES FROM PolyEG and PolyMO

PolyEG and PolyMO were mixed in appropriate ratios and reacted with a suitable isocyanate to produce adhesive. The adhesives passed the screening test (or a quick test) according to DIN EN 205. In the quick test (*Figure 1*), the adhesive was applied to a wooden spatula and for applications, the formulated adhesives must have the tensile strength of at least 10 N. mm⁻². The results of the tests are shown in *Table 1*.

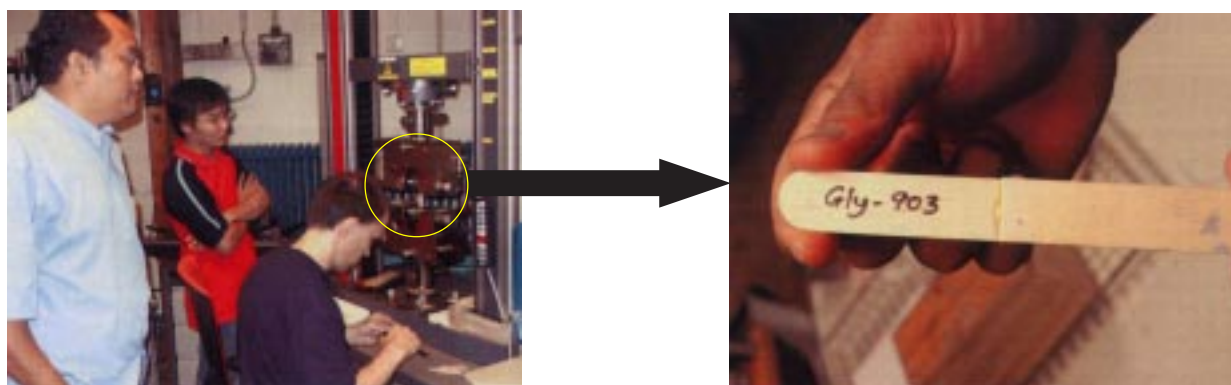


Figure 1. The quick test being carried out.

TABLE 1. RESULTS OF THE QUICK TESTS ON ADHESIVES OBTAINED FROM BLENDS OF PALM-BASED POLYOLS

Polyols	Isocyanate (%)	NCO/OH	OHV	Press method	Tensile strength (N. mm ⁻²)	Break
PolyEG-PolyMO	44.0	1.2	276	Room temperature	11	w
PolyEG-PolyMO	44.0	1.2	276	45 s at 103°C	13	w

Note: w means the break was within the wood.

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POTENTIAL APPLICATIONS

One potential area of application is in the sector involving medium density fibreboards (or MDF) where the blended palm-based polyols could be formulated as adhesive components. For building applications, the shear strength of the boards should be 0.2 N. mm⁻² for interior and 0.4 N. mm⁻² for exterior. The results from four experiments using different blends of polyols are shown in *Table 2*, whereas the preparations of the MDF are shown in *Figure 2*.

TABLE 2. THE AVERAGE TENSILE STRENGTH OF THE MDF BOARDS FROM FOUR BLENDS OF POLYOLS

No.	Isocyanate	Tensil N. mm ⁻²	Tensile strength at 1% isocyanate
Exp 1	6	1.5	0.25
Exp 2	2.5	0.6	0.24
Exp 3	4	1.2	0.30
Exp 4	3	1.0	0.33

Note: The polyols used were blends of polyols *i.e.* polyEG and PolyMO.



Figure 2. The preparation of medium density fibreboard (MDF) from application of adhesive, pressing of the fibre cake and the finished MDF board.

CONCLUSION

The results obtained thus far have shown that new palm-based polyols, with blending and formulation with suitable isocyanates lead to adhesives that have great potential applications, amongst which in the MDF industry.

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