PALM-BASED POLYOL FOR COATINGS

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RESEARCH ON PALM-BASED POLYOLS IN MPOB

Over the last 10 years, MPOB through Advanced Oleochemical Technology Division has put in a lot of efforts to search for new palm-based polyols. The current MPOB polyol POP resin, which can be produced at a pilot plant scale, can be converted into various types of polyurethane (PU) foams. The PU foams 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.

Recently, AOTD has found a new type of polyol named PolyMO and with a joint research with WKI, the PolyMO has been tested for 2K-PU coating system. Palm oil has carbon double bonds and can be subjected to some processes such as epoxidation, alcoholysis and esterification to give the desired reactivity in the final resin aimed for coating applications. The production of the PolyMO has been achieved at laboratory scale and the team members are actively trying to optimize the synthesis work for scaling up purposes.

2K-PU COATING FROM PolyMO

PolyMO was first converted into an alkyd resin through an esterification with a dibasic acid, which give the advantage of a higher molecular weight and the OH groups functionality that can be reacted with isocyanate to form coating film. Two types of coating have been developed where one was suitable for indoor, while the other suitable for outdoor especially in temperate countries. The performance of the 2K PU coatings was tested according to DIN 68861 and the results obtained are summarized in *Tables 1* and 2. The formulated coatings fulfilled all the requirements. No scratch resistance improving additives were used. The coatings were also subjected to artificial weathering UV-exposure as according to DIN EN 927-6. The results are shown in *Figures 1* to *4*. The results also showed that the PolyMO-based coating passed the tests.

TABLE 1. THE PHYSICAL CHANGES OF THE COATINGS (according to DIN 68861)

Part	1	2	4	6	7	9
Parameter unit	Cold liquids Visual evaluation	Abrasion Taber-test (u)	Scratching N	Cigarette Visual evaluation	Dry heat °C	Wet heat °C
EN	12720				12722	12721
A	s. norm	>600	>4.0	No change	180	100
B	s. norm	>350-600	>2.0-4.0	Change in gloss visible by naked eye	140	70
C	s. norm	>150-350	>1.5-2.0	Change in gloss and/or discolouring	100	55
D	s. norm	>50-150	>1.0-1.5	Obvious discolouring	70	
E	s. norm	>25-50	>0.5-1.0	Surface destroyed	55	
F	s. norm	δ 25				

Note: A to E is the ratings.

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TABLE 2. PERFORMANCE OF POLYMO-BASED COATING *vs.* WOOD-WOOD BASED VENEERS (according to DIN 68861)

DIN 68861	Requirement for working areas wood and wood-based materials coated with veneers	Palm oil-based coating
Part 1 chemical resistance	1C	1B
Part 2 abrasion resistance	2E	2D
Part 4 scratch resistance	4E	4D
Part 6 cigarette	No demands	6D
Part 7 dry heat	7C	7C
Part 8 wet heat	8B	8B

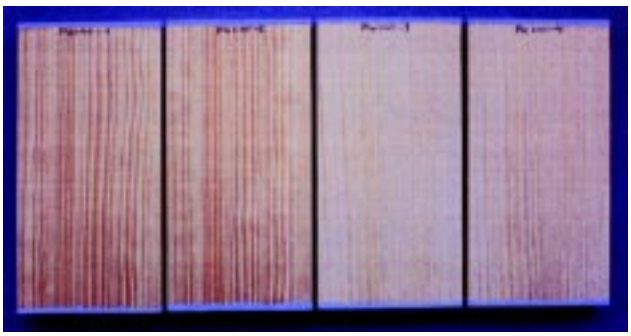

Figure 1. PolyMO 4 coating with UV protection before weathering.

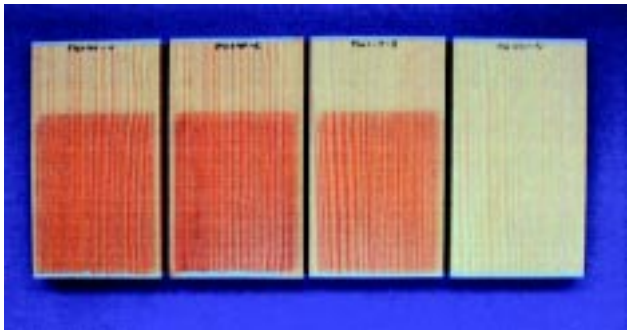

Figure 2. PolyMO 4 coating with UV protection after 1176 hr of weathering.

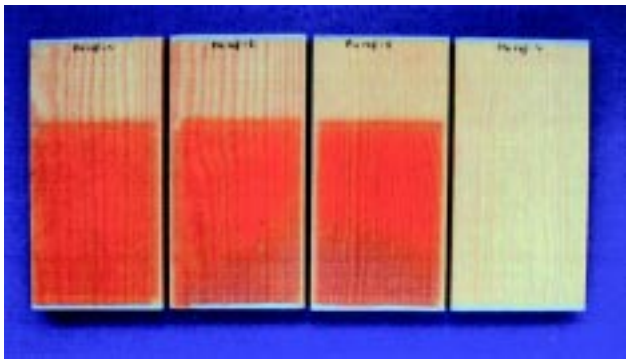

Figure 3. PolyMO 4 coating with no UV protection after 1176 hr of weathering.

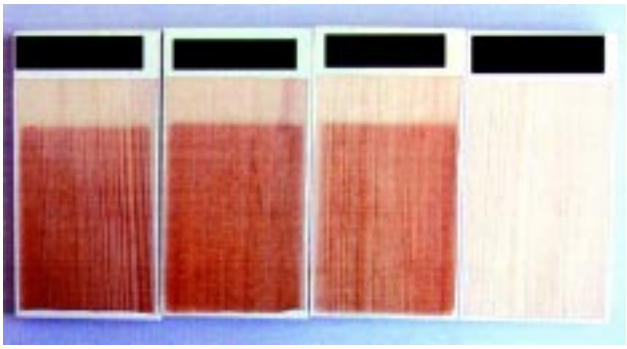

Figure 4. High quality commercial product A after 1176 hr of weathering.

Note: In *Figures 2, 3* and *4*, the colour change was due to the colour change of the pine wood.

CONCLUSION

PolyMO which is a new type of palm-based polyol, is suitable to be formulated into indoor and outdoor 2K-PU coatings.

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