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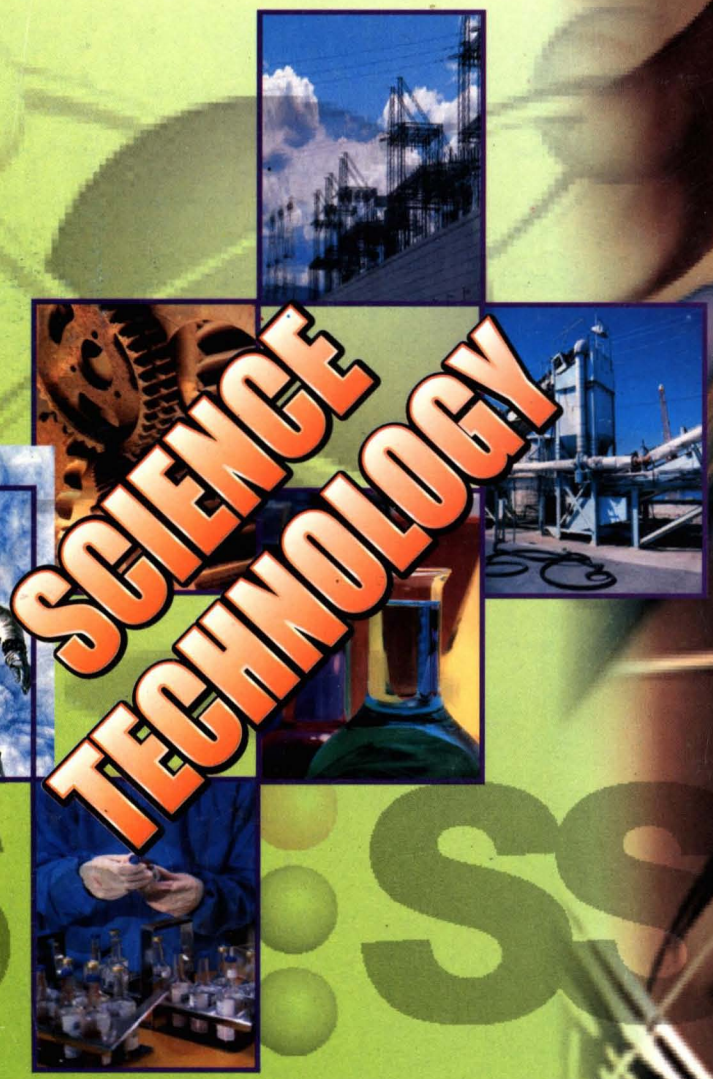

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Verification of Formaldehyde Emission Testing By Desiccator Method

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ABSTRACT

The objective of this study was to investigate the effect of conditioning duration and desiccator environment on formaldehyde emission by desiccator method (JIS A 1460: 2001). The medium density fibreboard (MDF) sample was obtained from the manufacturer and cut into standard size required of 50 mm x 150 mm for conditioning and testing purposes. For the duration of conditioning, samples were taken out for every 1, 3 and 7 days for formaldehyde content analysis. These desiccators were placed at two locations: growth chamber (temperature controlled at 20 ± 0.5° C) and normal room condition. The results show that the amount of formaldehyde released from the samples was steadily decreased as the duration of conditioning increased from 1 to 7 days for both growth chamber and normal room conditions. The formaldehyde content for samples located in growth chamber generally lower than the samples conditioned at room temperature.

Keywords : *conditioning duration, desiccator environment, desiccator method*

Introduction

Most composite wood products are fairly simple combinations of wood and water-based adhesives, which are composed of either urea-formaldehyde (UF) or phenol-formaldehyde (PF) resin, inorganic components that act as catalysts, and other minor components such as wax. Medium density fiberboard contains a higher resin-to-wood ratio than any other UF pressed wood product and is generally recognized as being the highest formaldehyde-emitting pressed wood product (Myers 1985). Among of the health effects of formaldehyde include eye, nose, and throat irritation; wheezing and coughing; fatigue; skin rash; severe allergic reactions and may cause cancer. Thus concerns on the emissions of formaldehyde led to regulations and standards that restricted the amount of formaldehyde that could be emitted from a product.

In order to get an approval for export to the Japanese market, the exporting companies have to comply with the Japanese test methods which are the Japanese desiccator's method or the small-scale chamber method. For the desiccator method, a result of less than 0.3 mg formaldehyde per litre is required for free use (F****) of the product. The verification is required as part of the requirement for the laboratory to examine various test method parameter on the formaldehyde emission values. It is one of the important requirements for the ISO 17025 accreditation by Department of Standard Malaysia (DSM). The objective of this study is to determine the effect of various parameters on the result of formaldehyde emission by desiccator method (JIS 1460:2001).

Material and Methods

The medium density fibreboard samples were obtained from the manufacturer. The samples were cut into 8 pieces of dimension (610 x 610 x 12) mm and properly wrapped with polystyrene before being transported to FRIM. Upon arrival at the laboratory, the test specimens were cut further into standard size required of (50 x 150) mm for conditioning and testing purposes.

The test samples were conditioned at conditioning chamber at temperature of 20 ± 2 °C and relative humidity of 65 ± 5%. Two replicates of test samples were carried out for each parameter. The samples were then transferred into separate desiccator which have approximately 300 ml of distilled water in glass crystal vessel and placed at the bottom of desiccator to absorb formaldehyde emission from the test samples. For the first parameter, duration of conditioning, the samples were taken out for every 1, 3 and 7 days of conditioning before the aliquot were taken for formaldehyde content analysis. While for the second parameter, desiccator environment, the desiccators were placed at two locations which at the growth chamber (temperature 20 ± 0.5 °C) and normal laboratory condition for 24 hours before the aliquot were taken for formaldehyde content analysis. Details of the experimental schedule were given in Table 1.

Table 1: Test implementation schedule

Duration of conditionings				Desiccator environment		
	Sample 1	Sample 2	Sample 3		Growth chamber	Room condition
Day 1	condition	condition	condition	Day 1		
Day 2	Test analysis	condition	condition	Day 2	Test 1st analysis	Test 1st analysis
Day 3		condition	condition	Day 3		
Day 4		Test analysis	condition	Day 4	Test 2nd analysis	Test 2nd analysis
Day 5			condition	Day 5		
Day 6			condition	Day 6		
Day 7			condition	Day 7		
			Test analysis		Test 3rd analysis	Test 3rd analysis

Results and Discussion

Table 2 shows the results obtained from the verification test. The results indicated that a significant effect of the formaldehyde content determined at various combination of conditioning duration and desiccator environment. Generally the formaldehyde content was reduced quite tremendously as the duration of the samples conditioned in conditioning chamber increased. Hence the optimum conditioning days need to be studied to ensure the test samples achieved a constant mass. A constant mass is considered to be reached when the results of the two successive weighing operations, carried out at an interval of 24 hrs do not differ by more than 0.1% of the mass of the test piece.

A significant difference of formaldehyde content was also found when the test samples were placed in growth chamber as compared to normal room condition. The formaldehyde content was higher in the desiccator placed at normal room temperature compared to those in growth chamber. This was probably due to higher room temperature and also temperature fluctuation during the 24 hrs exposure in room condition. This result also indicated that the environment temperature, in which the desiccator was placed during the test, played an important factor on the result of formaldehyde. Hence, the desiccator has to be placed in a growth chamber which has a constant temperature of 20 ± 0.5 °C to ensure consistent formaldehyde released from the samples tested.

Conditioning days	**Desiccator environment**	**Formaldehyde content (mg/L)**
1	Chamber	4.96
	Room	8.13
3	Chamber	4.16
	Room	7.09
7	Chamber	3.06
	Room	5.46

Table 2: Formaldehyde emission from test samples

Conclusions

The amount of formaldehyde released from the samples was steadily decreased as the duration of conditioning increased. Similar trend was observed in both desiccator environments. The formaldehyde content for the samples located at normal room condition was generally higher than those samples located in growth chamber. The study revealed the importance of strictly following the standard requirement of test samples conditioning as to achieve a constant mass before the samples could be taken for formaldehyde analysis. The samples may need more than 7 days to stabilise in which prolong the duration of analysis. The result also indicated that the importance of putting the desiccator in growth chamber as to provide a constant temperature during the 24 hours of formaldehyde released from the test samples and absorbed in distilled water.

Acknowledgements

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