Development of a New Testing Method of Formaldehyde Emission from MDF

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Abstract: The correlation between the two different methods of perforator and desiccator to evaluate formaldehyde emission from MDF was studied here. The formaldehyde emission from MDF was tested using the desiccator method under the different testing conditions. The results were compared and verified by the testing results using the perforator method. A unified model was built after expressing the testing data of the perforator method by the mg/100 g formation, which could couple the tested results using the above two testing methods. The results show that the new coupled model is much more executable and robust than both the desiccator and perforator method. The new testing method covered the factors, which affect the evaluating accuracy of formaldehyde emission from MDF, such as area, weight, and thickness.

Key words: MDF; formaldehyde emission; perforator method; desiccator method; coupled method
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1 Introduction

The perforator method does not consider the impact of the sample thickness and the environment. Skilled personnel are needed and the operation is complicated. The procedure of desciccator method is much simple. However, it takes a long time to do the test[1]. So far there is no a perfect model, which can couple the two measured results using the above two methods, because the results measured by the two methods are expressed in two different formations[2].

Here a novel testing method was proposed to evaluate the formaldehyde emission meanwhile a model was proposed to bridge the testing results of the two methods using mg/100 g data expressing formation.

2 Experiments

The 100-gram sample, which is about 18 pieces of the 20 mm-by-20 mm small samples, is operated according to the dessicator method. Then the measuring result is expressed in the formation of mg/100 g.

Three series of experiments were conducted to study the impacts of the thickness, the dimension, and the total weight change of the sample on the measured formaldehyde emission in order to develop the new method.

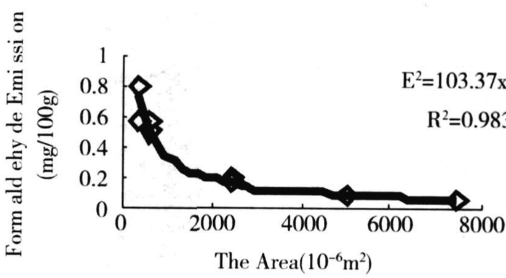

Fig. 1 The area vs. Formaldehyde emission

3 Results and analysis

The formaldehyde emission from per 100-gram sample decreased when the area of the sample was increasing. Top and bottom surfaces and the four edges were thought to be the releasing paths of formaldehyde[3]. The phenomenon that the amount of formaldehyde emission was not linear with the area of the sample surface showed that the efficiency of releasing from the edge path were not the same with that of the surface path.

The formaldehyde emission from per 100-gram sample decreased when the weight was increasing. The driving force of the formaldehyde emission from MDF is the pressure gap between the formaldehyde pressure inside the MDF and the environmental air pressure. The releasing velocity and amount of the formaldehyde depends on the pressure gap. The more the weight is, the smaller the pressure gap in an enclosed container is.

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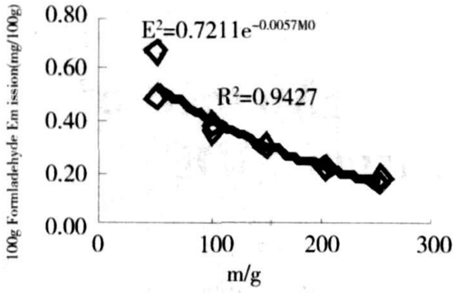

Fig. 2 The weight *vs*. Formaldehyde emission

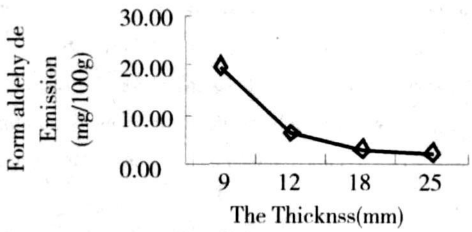

Fig. 3 The thickness *vs*. Formaldehyde emission

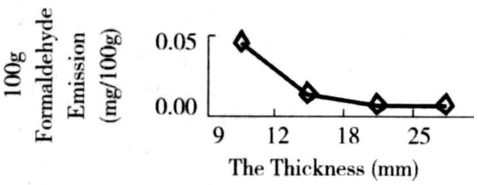

Fig. 4 The thickness *vs*. Formaldehyde emission (100g desiccator method)

It can be observed from Fig. 3 and Fig. 4 that the formaldehyde emission from 100-gram sample decreased when the thickness was increasing.

The formaldehyde emission measured using the two methods has a good linear agreement. The regression formula is $E_0 = 38.313E_2 + 0.2539$, $R^2 = 0.9819$.

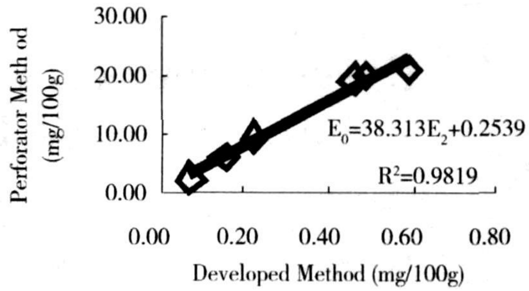

Fig. 5 Formaldehyde emission using the two methods

4 Conclusions

(1) The formaldehyde emission from per 100-gram sample decreased when the surface area of the sample was increasing.

(2) The optimum weight of the sample shall be around 105~110 gram when the sample dimension was 20 mm by 20 mm.

(3) The thicker the MDF is, the more the formaldehyde releases.

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MDF甲醛释放量评价新方法的研究

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摘 要：研究了MDF甲醛释放量两种评价方法（干燥器法和穿孔法）的关系，通过对不同测试条件下用干燥器法对MDF甲醛释放量进行检测，其结果用穿孔法的检测结果进行对比和检验。用穿孔法的mg/100g为单位表达检测数据，能结合两种检测方法的结果，建立了一种统一的模型。通过对影响甲醛释放量评价准确性的几个因素（表面积，质量，厚度等）进行研究，表明新的结合模型比原有的两种方法更具有可行性和科学性。

关键词：MDF；甲醛释放；穿孔值；干燥器；新方法
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