

## PRODUCTION OF CEILING BOARD USING LOCAL RAW MATERIALS

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**Abstract:** This piece of work investigated the production of ceiling board from rice husk and cassava starch. The rice husk and cassava starch were mixed properly in the ratio of 70:30, 60:40, 50:50, 40:60 and 30:70. Physical properties such as water absorption, density and flaking concentration of the developed ceiling board were determined. Results of the study showed that the density of the developed ceiling board increased with increase in cassava starch concentration. It was also noted that the flaking concentration of the developed ceiling board decreased as the cassava starch concentration increased to 40wt% and increased with further increase in cassava starch concentration. Addition of cassava starch in excess of 50wt% caused a decrease in flaking concentration. Water absorption of the developed ceiling board increased with increase in cassava starch concentration. The water absorption decreased as the cassava starch concentration increased to 60wt%, and increased with further increase in cassava starch concentration.

### **Introduction**

A ceiling board is a horizontal slab covering the upper section of a room or internal space (Adegbemi, 2010). It is generally not structural but is a shell concealing the details of the structure above. However, the ceiling might be holding up building materials such as heat or sound insulation. In modern buildings, electric lights, smoke detector, security cameras and signage are commonly attached to ceilings (Ahn and Moslemi, 1980). This piece of work however, is based on the production of ceiling board from local raw materials. These local raw materials include cement, fibre cellulose, fibre obtained from ground paper, mainly waste paper, water and some other additives. There are different types of ceiling boards. These include: gypsum ceiling boards, acoustical ceiling boards, gypsum fibre ceiling boards and cement fibre ceiling boards etc. These types of ceiling boards are grouped in accordance to the raw materials used for the production (Ajayi and Fuwape, 2005). Gypsum ceiling boards are produced from gypsum, Acoustical ceiling boards are obtained from mineral wool, gypsum, small amount of paper and starch.

Gypsum fibre ceiling boards are produced from gypsum and fibre to reinforce the ceiling board. This work however is based mainly on the production of fibre cement ceiling boards. This consist essentially of an inorganic binder usually calcium silicate formed by the chemical reaction of a siliceous material and a calcareous material. This is reinforced by organic fibres, fillers and pigment compatible with the fibre reinforced cement to form a ceiling board (Ajiwe et al., 1998).

In the past, ceiling boards were produced using Asbestos a fibre present naturally in rocks. It was used because of its high tensile strength, poor heat conductivity and high fire resistance (Amenaghawon et al., 2016). However, asbestos causes asbestosis, which leads to cancer. As a result of this problem, manufacturers of ceiling boards went into research to find out substitutes that can be used in the production of ceiling board (Amenaghawon et al., 2016). This substitute includes shredded wood, cellulose fibre agricultural waste etc. Rather than industrial products (glass-fibre, iron filling) and man-made materials, the fibres best suited to the socio-economic circumstances of developing countries are natural fibres.

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Provision of ceiling covering is an essential stage in the building process.

The aim of this work is to investigate the production of ceiling board from rice husk and cassava starch.

While the Objectives are as follow:

- To examine the suitability of rice husk and cassava starch in production of ceiling board.
- To vary the proportion of the cassava starch and determine physical properties of the ceiling board developed.

## Materials and Method

Rice husk, cassava starch, epoxy resin and hardener are the materials used for this research. The rice husk and cassava starch were sourced locally while the epoxy resin and hardener were obtained from Bridge Head market, Onitsha. The equipment used in this research included rectangular moulds, weighing balance, hydraulic jack. The hydraulic jack was used for compaction of the ceiling board after casting. Other apparatus used were wooden rectangular slash, metal slab, measuring cylinder, table spoons and wood stirrer.

A mould of size 380 x 380mm with a thickness of 8mm was adopted for casting the ceiling board under study. The mould was cleaned and oiled lightly with petroleum lubricant.

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The required amount of the materials for each ceiling board developed was determined using the digital weighing balance. Physical properties of the developed ceiling board samples such as Water absorption, flaking test and density were determined.

## Results and Discussion

The result of the developed ceiling board is shown in Table 1 and Figures 1-3.

Physical properties of the developed ceiling board such as Density, water absorption and flaking concentration of the developed ceiling board as shown in Table 1 below.

Rice husk absorption (wt%)	Cassava starch Flaking conc. (wt%)	Density (g/cm <sup>3</sup> )	Water (%)
70	30	1.08	9.3
2.5	60	1.26	10.0
1.5	50	1.36	10.3
2.0	40	1.53	6.8
1.5	30	1.72	9.3
0.6			

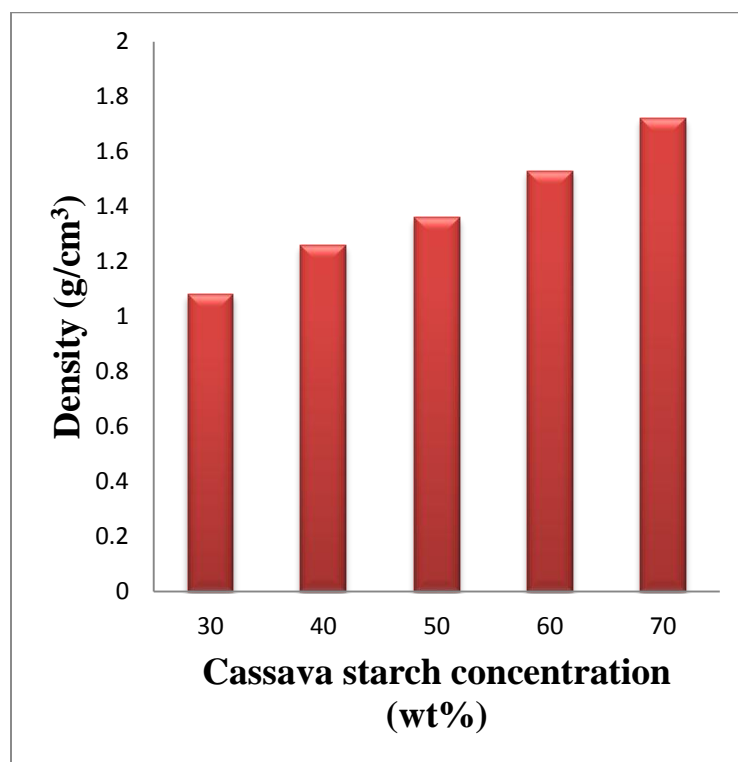
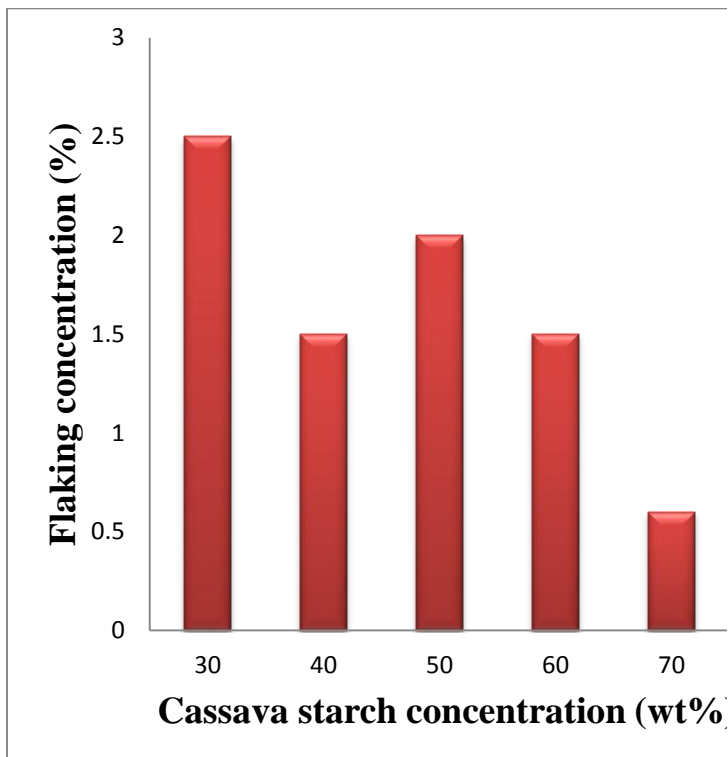
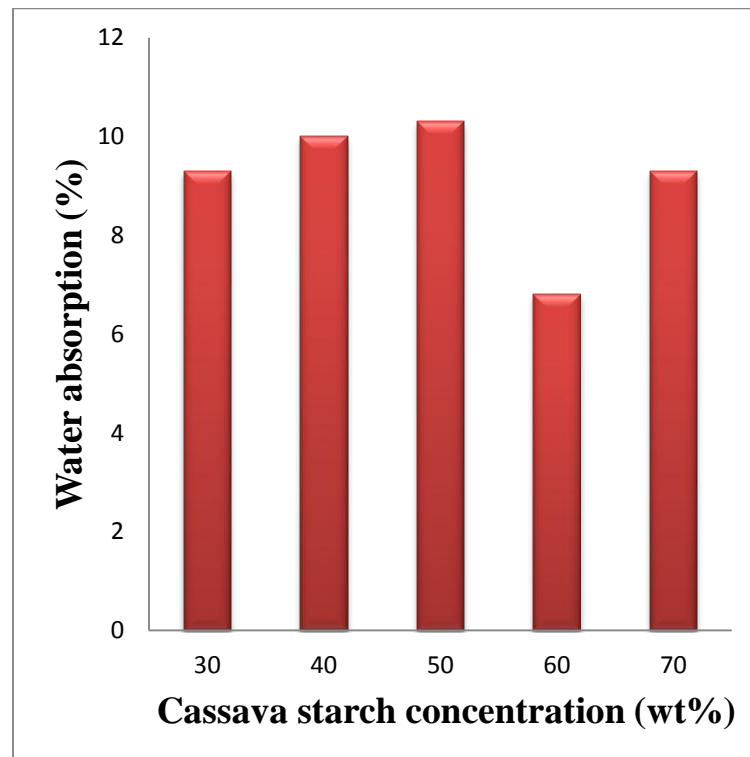


Figure 1: Effect of cassava starch concentration on the density of ceiling board



**Figure 2: Effect of cassava starch concentration on the flaking concentration of ceiling board**



**Figure 3: Effect of cassava starch concentration on the water absorption of ceiling board**

A study of production of ceiling board from rice husk and cassava starch has been carried out in details using standard technique. The following conclusions were drawn from the results of the analysis.

- The density of the developed ceiling board increased with increase in cassava starch concentration.
- The flaking concentration of the developed ceiling board decreased as the cassava starch concentration increased to 40wt% and increased with further increase in cassava starch concentration.
- Addition of cassava starch in excess of 50wt% caused a decrease in flaking concentration with increase in starch concentration.
- Water absorption of the developed ceiling board increased with increase in cassava starch concentration.
- The water absorption decreased as the cassava starch concentration increased to 60wt%, and increased with further increase in cassava starch concentration.



Further study is needed to investigate the effect of cassava starch concentration on the mechanical properties of the ceiling board.

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