



# Single and multi-factor analysis on screw-holding power of corn straw fiber brick

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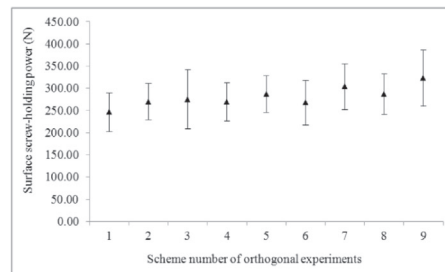
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## HIGHLIGHTS

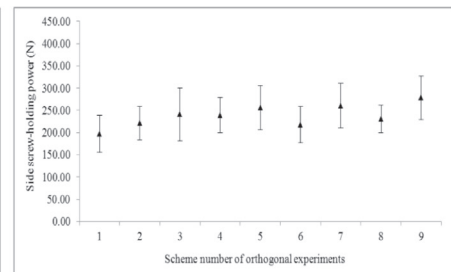
- Surface-screw holding power is affected successively by corn straw fiber, cold press time and calcium hydroxide.
- Surface and side-screw holding powers are affected extremely by corn straw fiber.
- Side screw holding power is affected extremely significantly by cold press time.

## GRAPHICAL ABSTRACT

Corn straw fiber brick is environmental friendly. Its screw-holding power is important to hang light goods in the interior partition. Single and multi-factor methods are applied to study the screw-holding power. Surface-screw holding power is affected successively by corn straw fiber, cold press time and calcium hydroxide. Surface and side-screw holding powers are affected extremely by corn straw fiber, surface-screw holding power is affected significantly by cold press time, and side screw holding power is affected extremely significantly by cold press time. When calcium hydroxide is 1924 g, corn straw fiber is 377 g and cold press time is 6 min, surface screw-holding power of brick is 323.30 N and screw-holding power is 278.20 N at the 19.12% of moisture content. The conclusions provide a theoretical basis for improving the screw holding power of the brick.



(a) Surface screw-holding power



(b) Side screw-holding power

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## ABSTRACT

Corn straw fiber brick is environmental friendly. Its screw-holding power is important to hang light goods in the interior partition. Single and multi-factor methods are applied to study the screw-holding power. Surface-screw holding power is affected successively by corn straw fiber, cold press time and calcium hydroxide. Surface and side-screw holding powers are affected extremely by corn straw fiber, surface-screw holding power is affected significantly by cold press time, and side screw holding power is affected extremely significantly by cold press time. When calcium hydroxide is 1924 g, corn straw fiber is 377 g and cold press time is 6 min, surface screw-holding power of brick is 323.30 N and side screw-holding power is 278.20 N at the 19.12% of moisture content. The conclusions provide a theoretical basis for improving the screw holding power of the brick.

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## 1. Introduction

The burning of corn straw is a serious environmental pollution problem, which must be solved to build beautiful China. It is a new way to solve the problem that corn straw fiber and calcium hydroxide is molded into wooden brick. Brick is good in color and touch. It can regulate indoor air humidity, and improve air quality and comfort because that it is excellent in moisture absorp-

tion and desorption. Therefore, corn straw brick is used to build the indoor partition wall.

Brick is wooden and screw is knocked on its surface and side to hang the light decorative paintings, clothes and other goods. When a screw is studded vertically into the brick, some fibers are cut off and some ones are squeezed to form the screw-holding power. The greater the screw holding power is, the stronger the fixed force is [1]. Lateral shear force is perpendicular to the screw stalk and

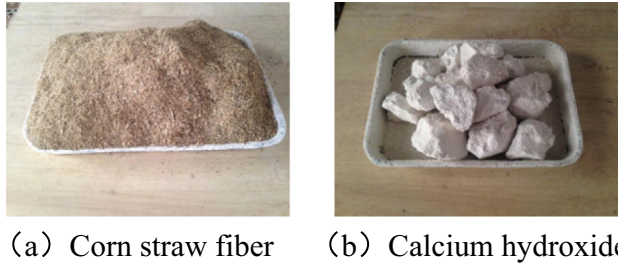


Fig. 1. Raw materials.

Table 5  
Orthogonal experimental schemes.

No.	Mass of calcium hydroxide (g)	Mass of corn straw fiber (g)	Cold press time (min)
1	1844	337	2
2	1884	337	6
3	1924	337	10
4	1844	357	6
5	1884	357	10
6	1924	357	2
7	1844	377	10
8	1884	377	2
9	1924	377	6

Table 1  
Properties of corn straw fiber and calcium hydroxide.

Materials	Corn straw fiber		Calcium hydroxide	
	Range	Mean	Range	Mean
Moisture content (%)	9.33–11.94	10.29	47.52–52.33	49.63
Density (g/cm <sup>3</sup> )	0.097–0.138	0.103	0.973–1.217	1.070

Table 2  
Corn straw fiber mesh structure.

Mesh (No.)	10	20	30	40	50	60	70	80	90	100	>100
Mass percentage (%)	3.18	6.99	6.35	14.24	13.93	2.94	5.42	4.26	4.49	5.17	33.02

Table 3  
Mass schemes of corn straw fiber.

No.	Mass of calcium hydroxide (g)	Mass of corn straw fiber (g)	Total mass (g)	Cold press time (min)
1	1864	327	2191	10
2	1864	337	2201	10
3	1864	347	2211	10
4	1864	357	2221	10
5	1864	367	2231	10
6	1864	377	2241	10
7	1864	387	2251	10
8	1864	397	2261	10
9	1864	407	2271	10
10	1864	417	2281	10

Table 4  
Mass schemes of calcium hydroxide.

No.	Mass of calcium hydroxide (g)	Mass of corn straw fiber (g)	Total mass (g)	Cold press time (min)
1	1744	377	2121	10
2	1764	377	2141	10
3	1784	377	2161	10
4	1804	377	2181	10
5	1824	377	2201	10
6	1844	377	2221	10
7	1864	377	2241	10
8	1884	377	2261	10
9	1904	377	2281	10
10	1924	377	2301	10

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