Addition of Nano Particles Effect of Rice Husk Ash as a Mixture On The Bricks Strength

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Abstract. This study aims to: 1) Determine the effect of the addition of rice husk ash particles to increase of the quality and composition of stones, 2) Determine the effect of the use of nano-particles of rice husk ash on compressive strength and tensile strength of bricks, 3) Determine the effect of the use of nano particles paddy husk ash bricks against density. This research method was Carried out by varying the nano-particles of rice husk ash to clay / clay with a variation of (0%, 100%); (5%; 95%); (10%; 90%); (15%; 85%); (20%; 80%). In each sample the strength of the bricks was tested (compressive strength, tensile strength, density). The mixture was printed and dried naturally for 14 days and continued with burning for 3 x 24 hours. Based on the Standardization of SII-0021-1978 bricks compressive strength of 50-5.0 MPa. X-Ray Diffraction analysis is used to identify the crystalline phase in the material to Obtain particle size. The results of X-Ray Diffraction analysis by adding 5% nano-husk ash particles of rice husk or without using nano-husk ash particles of rice husk in clay have the dominant phase of Silica Dioxyde (Quartz) with trigonal crystal structure (hexagonal axes).

Key Word : Bricks, Rice Husk Nano Particles, Press Strength, X-Ray Diffraction.

1. Introduction

The use of bricks as a building material has long been known and used by people in residential buildings, buildings, fences, drains and foundation in both rural and urban. As for the quality of the bricks provided most easily cracked, broken, uneven surface and angle the elbow due to lack of quality bricks produced. Maka the resulting need to increase production, by increasing the quality of materials alone (the basic material of clay or clay) or with mixing the ingredients that are pozzolan such as rice husk ash nano particles into the base material brick maker,

The main ingredient in the manufacture of clay bricks. The clay has the plasticity and dry shrinkage so it is important to simplify the initial process of making bricks [1]. Loam or clay is composed of silicon oxide (SiO2), aluminum oxide (Al2O3), iron oxide (Fe2O3), lime (CaO), magnesium oxide (MgO) and other chemical compounds, while the sand is formed of silicon oxide (SiO2) [2].

Rice husk ash agricultural waste utilization is extremely rare, due to the low nutritional value and have a fairly high ash contentwhich is about 23% [3]. burning ontemperature 400°C - 500°C will become amorphous silica and at temperatures higher than 1000 °C will be crystalline silica [4]. Abu silica content ranges from Rice Husk 92-95%, very porous and light, and has a very large surface area [5]. The result of the burning of such materials can improve pozzolan reaction to produce calcium silicate hydratevery good for the quality of bricks [6]. Wash rice husk as a source of silica using H2SO4 will result in the synthesis of zeolite Y [7]. The addition of a substance containing nano-

particles of silica such as rice husk ash can increase the holding capacity and the quality of the bricks [8].

Rice husk ash has a very high pozzolanic activity that is superior Supplementing cementitious material (SCM) such as fly ash, slag and silica fume [9]. Amorphous silica formed when silicon is thermally oxidized. Usually the amorphous silica has a density of 2:21 g / cm3 [10]. Rice Husk Abu silica in the form of crystalline (quartz and opal) and amorphous concentrated on the outer surface and a little on the inside husk ash [11]. Rice Husk ash resulting from the burning of rice husk at a temperature of 500o C 400o- will produce amorphous silica and at temperatures greater 1.000o C will be crystalline silica [12]. This ash is known as the Rice Husk Ash (RHA) contains silica (SiO2) of about 94- 96% [13].

2. Research methods

The first step that must be done is setting up tools and materials to be used. Clay as the base material, sun-dried until dry. Rice husk was burned to ashes and then sieved with a 200 mesh sieve to form a fine powder. Furthermore, all materials are weighed according to a predetermined composition, namely:

Table 1. Composition Clay and Abu Rice Husk

Code Sample Test	Mixture composition Clay And Nanoparticle Abu Rice Husk	
	Clay %	Rice Husk ash %
A	100	0
B	95	5
C	90	10
D	85	15
E	80	20

All the materials are mixed and molded into a wooden mold that has been prepared. Furthermore, the drying step is done by drying in the hot sun for 14 days (if good weather). After that continued in the combustion process is done in the use of wood burners for 3 x 24 hours without stopping because it affects the quality level of the power brick. The next stage of cooling carried out at room temperature for 3 x 24 hours. Brick finished testing the samples to see the quality of the strong Pull, compressive strength and density of which is tested through the analysis of XRD, SEM and XRF.

3. Result and Discussion

Brickyard in addition to the composition of nano particles of rice husk ash is unbelievably affect the quality of the power brick. Results of testing the effect of adding nano particles of rice husk ash as a mixture with variations A1 (100: 0)%, A2 (95: 5)%, A3 (90:10)%, A4 (85:15)%, A5 (80: 20)% shown in Table 2 below.

Table 2. The test data of density, water absorption and compressive strength brick

Variations mix (%)		Average mass type, ($\overline{\rho}$) (G / cm3)	water absorption average ($\overline{WA}$) (G / dm 2 / min)	Average Compressive Strength ($\overline{P}$) (MPa)
Clay / clay	Nanoparticles of rice husk ash			

100	0	1:54	10:24	2:51
95	5	1:52	11.84	3.3
90	10	1:51	14.66	3.1
85	15	1.4	18:42	3:04
80	20	1:38	20:32	2.85

Testing of physical and mechanical properties of bricks made after the cooling step. From the test results bricks using 100% clay and 0% rice husk ash obtained by the density of the average 1:54 g / cm3, water absorption average of 10:24 gr / dm 2 / min, and the compressive strength of the average 2:51 MPa. For brick clay 95% and 5% rice husk ash obtained an average density of 1.52g / cm3, water absorption average of 11.84 g / dm 2 / min, and the average compressive strength of 3.3 MPa. For brick clay 90% and 10% rice husk ash obtained an average density of 1:51 g / cm3, water absorption average of 14.66 g / dm 2 / min, and the average compressive strength of 3.1 MPa. For brick clay 85% and 15% rice husk ash obtained an average density of 1.4 g / cm3, water absorption average of 18:42 gr / dm 2 / min, and the average compressive strength MPa 3:04. while bricks using clay to 80% and 20% rice husk ash obtained an average density of 1:38 g / cm3, water absorption average of 20:32 gr / dm 2 / min, and the average compressive strength of 2.85 MPa. XRD analysis of the power brick and the best 5% of normal bricks can be seen in the following figure:

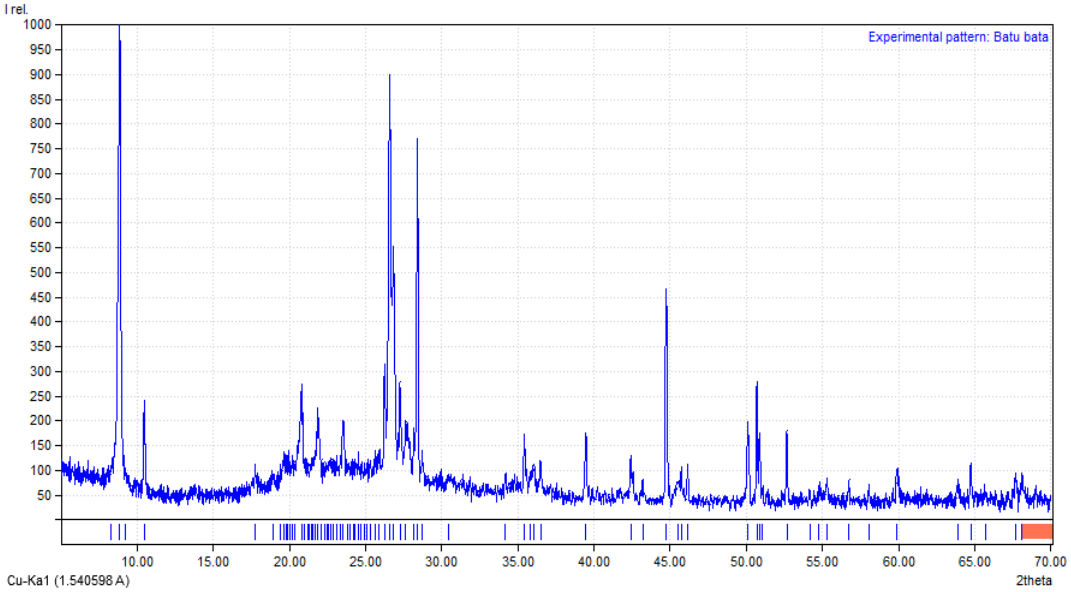

Figure 1. XRD patterns on the brick normal

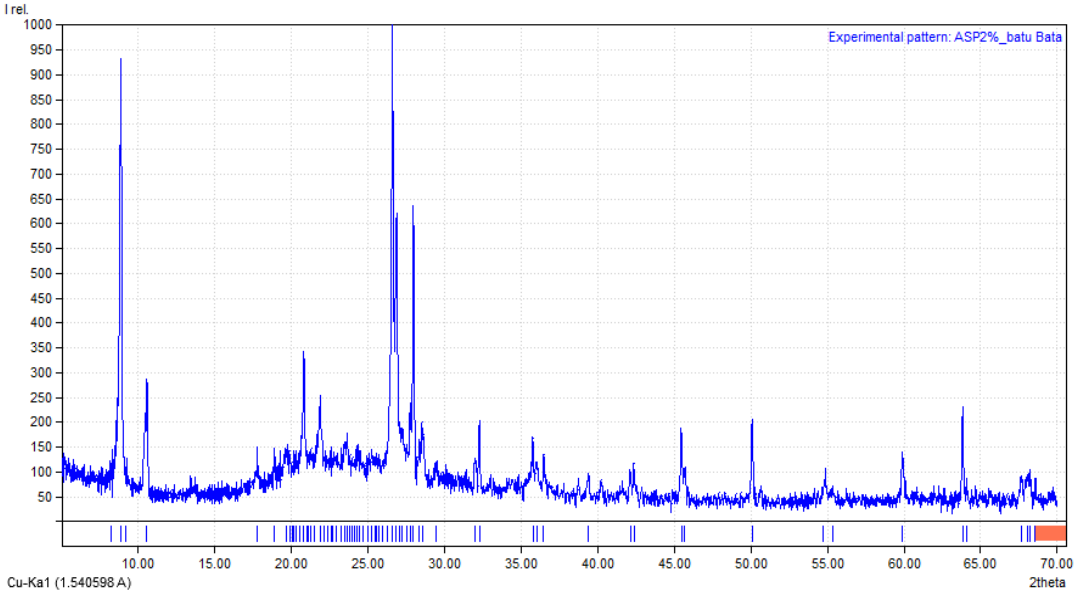

Figure 2. XRD patterns on the bricks with 5% ASP

3.1 Relations Abu rice husk addition to the Water Absorption

From **Table 1.** the addition of rice husk ash as much as 20% turned out to show the water absorption is higher with values section rate allowable 20 g / dm 2 / min [15], compared to brick with rice husk ash 0%, 5%, 10%, and 15% with long immersion for 6 minutes.

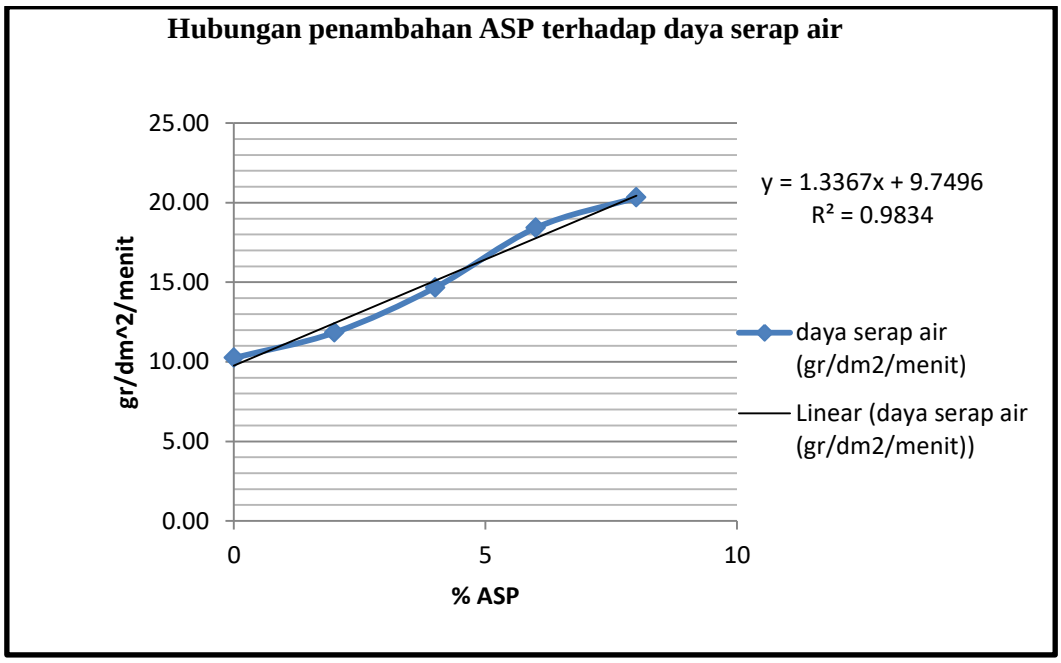

Figure 3. The relationship between the percentage of the volume of rice husk Abu Absorption Air bricks.

By using an excel program obtained linear-shaped graph with the equation $y = 1.336x + 9.749$ of the relationship between the percentage of the volume of rice husk ash to the absorption of bricks.

From the graph, the tendency addition of rice husk ash could improve the water absorption of bricks per minute. This is due to the porosity of rice husk ash is very high causing rice husk ash can absorb water in large quantities [16].

3.2. The addition of Rice Husk Abu relationship to the Compressive Strength Bricks

From the test results, obtained an average compressive strength of normal brick and brick plus husk ash rice husk ash with a composition of 5%, 10%, 15% and 20% respectively is 2:51 Mpa; 3.3 Mpa; 3.1 Mpa; 3:04 MPa; and 2.82 MPa. Based on the data, the use of rice husk ash as much as 5% was found to show that the optimum compressive strength compared to normal brick. The use of rice husk ash 10% increase in the compressive strength of 3.1 MPa, the composition of the 15% increase by 3:04. While the composition of the 20% increase to 2.82 MPa.

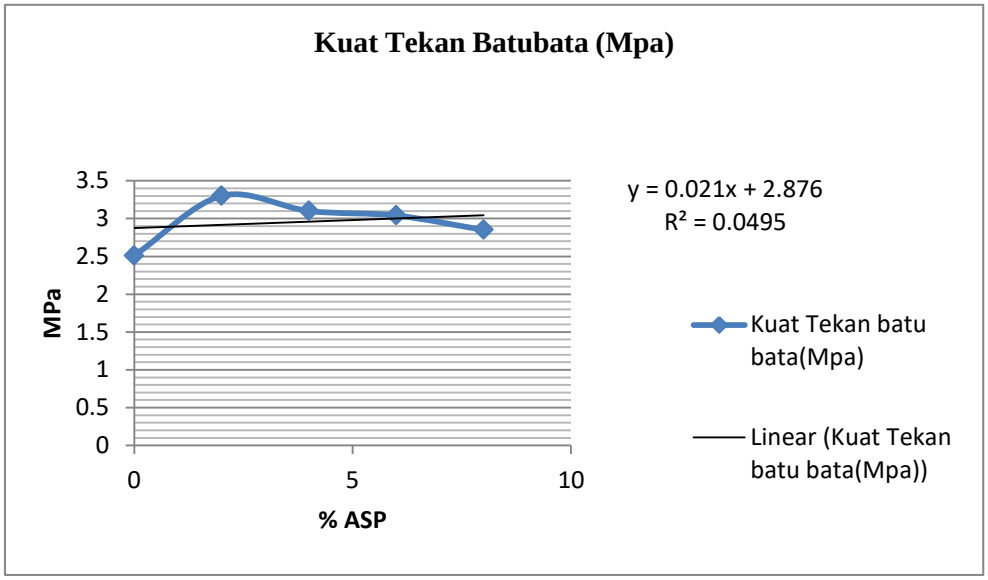

Figure 4. The relationship between the percentage volume of the rice husk ash bricks Compressive Strength

By using an excel program chart obtained by the equation y = 0.021x + 2,876 of the relationship between the percentage of the volume of rice husk ash to the compressive strength of bricks. With the addition of rice husk ash was good at 5% of the amount of clay with a value of 3.3 MPa compressive strength.

0021-1978 SII-based standardization red brick compressive strength brick addition of rice husk ash 5% near 50 class quality standard of 5.0 Mpa. While brick with 0%, a mixture of rice husk ash were in class quality standards 25. From the data obtained, the tendency use rice husk ash as a mixture of the brick will increase the strength of the bricks, but more and more uses rice husk ash can decrease the strength compressed bricks.

3.3 Massa relationship type to Abu Addition Rice Husk

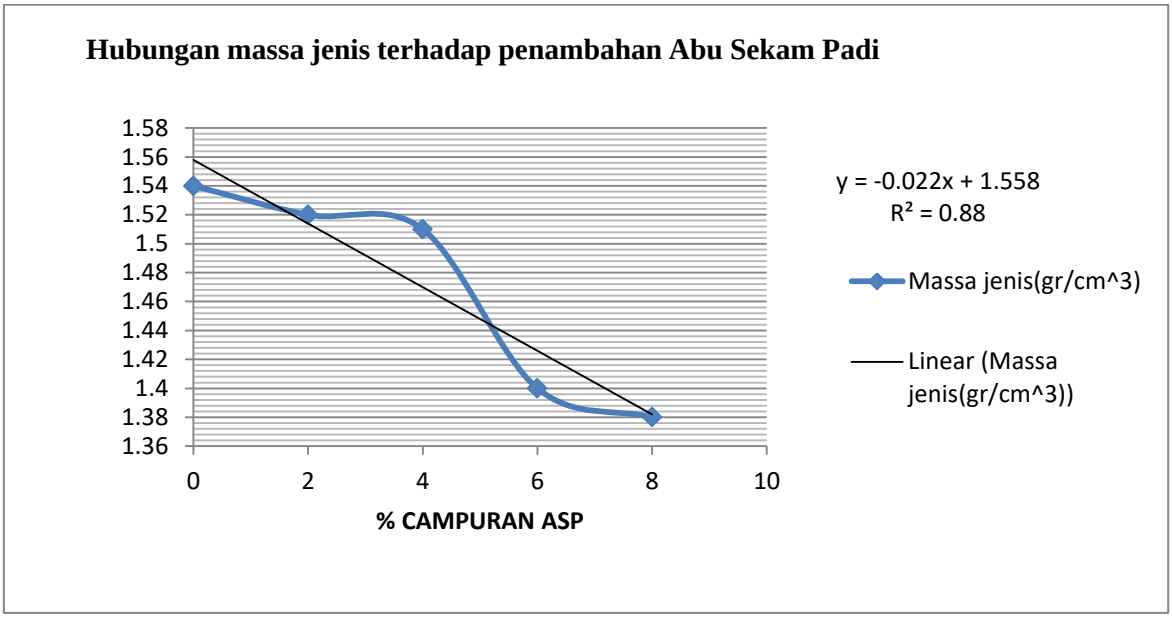

Figure 5, The relationship between the mass-to-volume type of rice husk ash

By using an excel program obtained graph the relationship between the density of the addition of rice husk ash to the equation is $y = -0.022x + 1.558$

3.4. XRD analysis

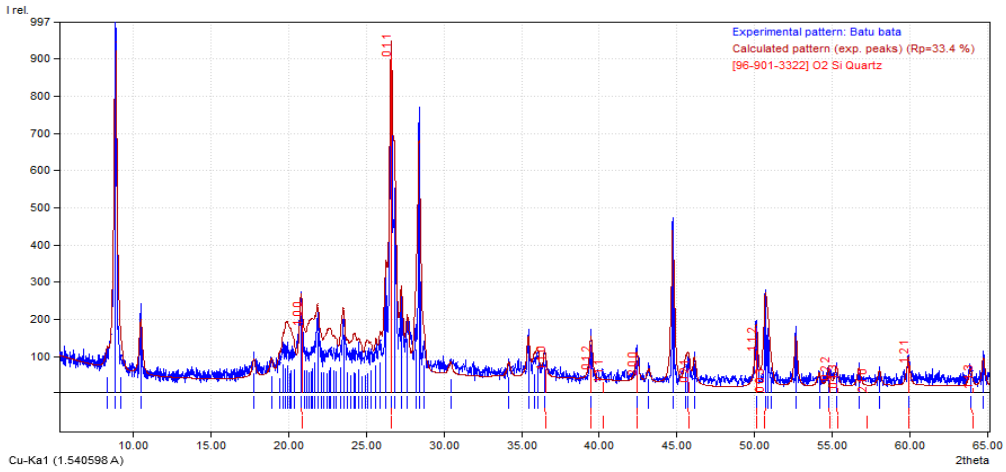

Figure 6. Normal phase matching bricks on Quartz

Based on the chart above, the bricks that had been burned and smoothed has a dominant phase of SiO2 (Quartz), analyzed brick pattern (blue) matches the standard pattern for phase Quartz (red) based on the XRD pattern database with reference number96-901-2601, Brickwith Quartz phase has a trigonal crystal system (hexagonal axes) with a = 4.9134 Å c = 5.4051 Å, with a density of 2.64900 g / cm3.

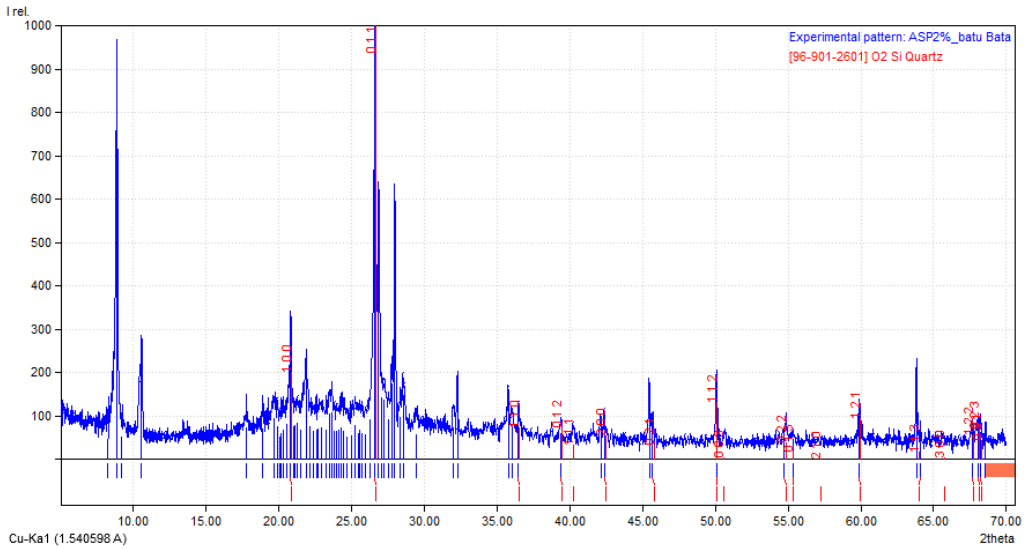

Figure 7. Phase matching bricks with 5% ASP on Quartz

Based on the chart above, the bricks that had been burned and smoothed has a dominant phase of SiO2 (Quartz), analyzed brick pattern (blue) matches the standard pattern for phase Quartz (red markings) based database XRD pattern with a reference number96-901-2601, Brickwith Quartz phase has a trigonal crystal system (hexagonal axes) with a value a = 4.9140 Å c = 5.4060 Å, With a density of2.64800 g / cm³,

Conclusion

The more the rice husk ash is added to a mixture of brick making, the higher the absorption of water SII-based standardization 0021-1978 compressive strength of bricks on a mixture of nano-particles of rice husk ash 5% near 50 class quality standard of 5.0 MPa compared to the others. However, the more the composition of the mixture is given to reduce the level of compressive strength of bricks.
The bricks are normal with Quartz phase has a trigonal crystal system (hexagonal axes) with a = 4.9134 Å c = 5.4051 Å, with a density of 2.64900 g / cm3.
Bricks with addition of 5% Quartz ASP phase has a trigonal crystal system (hexagonal axes) with a valuea = 4.9140 Å c = 5.4060 Å, With a density of 2.64800 g / cm³,

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