Study of Zeolite Phase Made from Rice Husk Ash and Sidrap Clay

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Intruduction

Zeolite is a crystalline alumina silica which has a three-dimensional skeleton structure with a cavity inside. The structure and hollow framework of zeolite make zeolite has many uses including as an absorbent, ion exchange, gas sensor, catalyst and molecular filter. Besides being porous, zeolites also have a unique structure and shape. Besides, the strength of zeolite acid can also be controlled.

Zeolite is usually synthesized through solvothermal or hydrothermal methods, under suitable conditions, such as reaction time and temperature, atomic source, mineralization agent, template and calcination temperature. Zeolite which is synthesized by hydrothermal method generally uses silica, alumina and metal cations as precursors in the presence of an organic template.

About 20% of the weight of rice is rice husk, and varies from 13 to 29% of the composition of the husk is husk ash which is generated every time the husks are burned. The most common values of silica (SiO2) content in rice husk ash are 94–96%. The high content of silica in rice husk ash, so it can be used in the manufacture of zeolite-based materials. Clay minerals are layered silicates; The crystal structure of these minerals is composed of SiO4 tetrahedron layers. Clay minerals, consisting mainly of aluminum and / or iron and magnesium silicates. Some of them also contain alkaline or alkaline earth as their basic component.

In this research, zeolite synthesis will be carried out using the hydrothermal method by utilizing the waste of rice husk ash and clay which is widely available in the Sidrap area of South Sulawesi where, in rice husk ash and clay, it contains silica which can be used as a zeolite material.

METHODOLOGY

The clays used were dehydroxylated for 4 hours at 750 °C and rice husk ash was dehydroxylated at 850 °C pada for 4 hours.

The method used in the manufacture of zeolite is the hydrothermal method using an autoclave. Clay and rice husk ash was activated using a solution of NaOH and H_2O and mixed 2.5 grams of $AlCl_3$.

Tabel 1. Chemical compositions for zeolite production

Sample Identity	Mass of raw material (gram)			
	NaOH+H2O	AlCl3	ASP	Clay
A31 AlCl3 100 °C	20,5	2,5	5	25
A31 AlCl3 100 °C	20,5	2,5	6,5	25
B31 100 °C	25,5	-	5	25
B32 100 °C	25,5	-	6,5	25

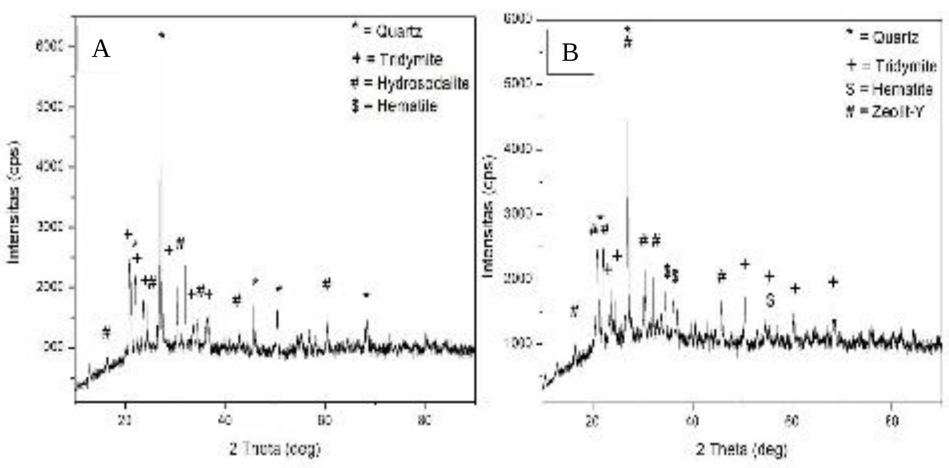
Result

A. X-ray Fluorescence (XRF) Results

Tabel 2. Results of XRF Characterization

Element	Clays (wt%)	RHA (wt%)
Al2O3	18,00	-
SiO2	45,80	93,40
K2O	0,78	4,53
CaO	0,29	1,34
TiO2	2,19	-
V2O5	0,13	-
Cr2O3	0,11	-
MnO	0,085	0,466
Fe2O3	32,71	32,71
NiO	0,030	-
CuO	0,12	0,071
ZnO	0,029	0,054
ZrO2	0,11	-

B. Characterization of X-Ray Diffraction (XRD)



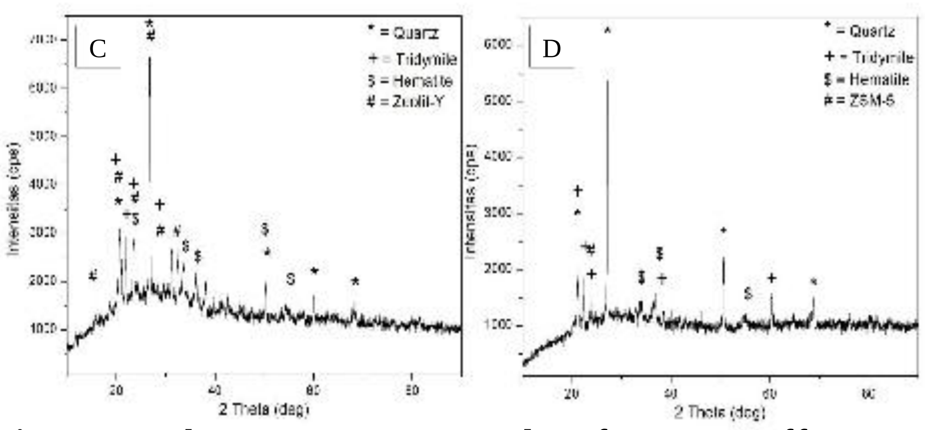


Figure 1. Characterization Results of X-Ray Diffraction (XRD) A) A31 AlCl3,B) A32 AlCl3, C) B31, and D) B32.

C. Hasil Karakterisasi *Scanning Electron Microscopy* (SEM)

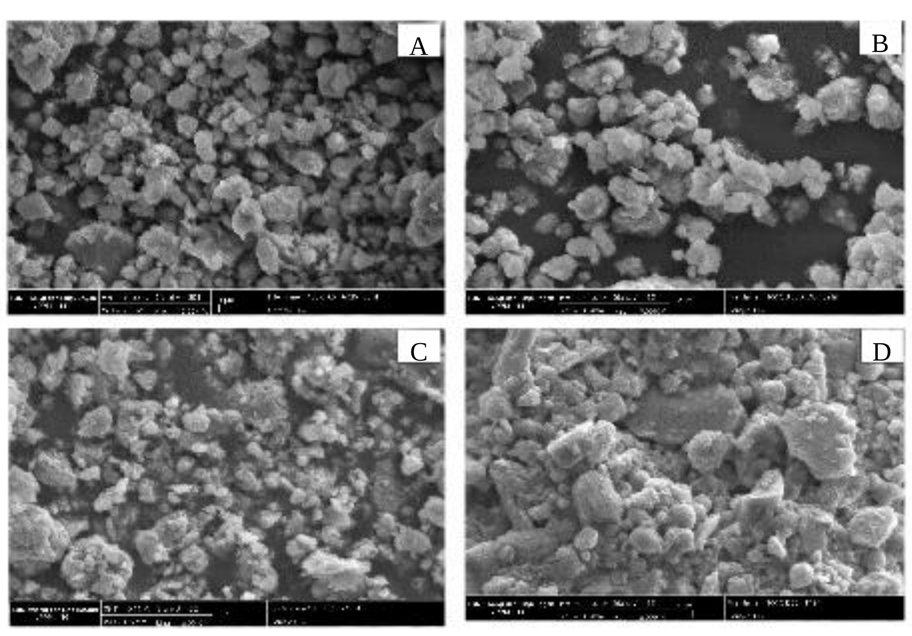


Figure 2. Scanning Electron Microscopy (SEM) Characterization Results of Zeolite with magnification of 10,000 kx A) A31 AlCl3, B) A32 AlCl3, C) B31, and D) B32.

Advantage

New parameters are recommended in the manufacture of zeolites

Acknowledgments

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