

Ytong

The Quest for Lightweight Insulative High Temperature Ceramics

By Ken Goyer



The main impediment to making a really great Rocket stove remains the lack of a really good lightweight, insulative, refractory, durable, and cheap ceramic which will withstand the extremely high temperatures necessary for really good combustion to take place. When something new and promising comes along it is worthy of investigation.

While making stoves in Turkey I discovered Ytong. Ytong is aerated concrete. It is used in many countries as a building product but it is not used much in the United States so we don't know very much about it. Ytong is inexpensive. It is very light weight, weighing four tenths of a gram per cubic centimeter. It is tough and strong yet it can be worked with ordinary tools. But in spite of these seductive qualities, it is still concrete and after working with it and testing it I don't believe it to be the solution to our problems. But I would like to tell you about what I have found out about it.

Ytong is made from finely ground silica and cement. Aluminum powder and quick lime are added. While the cement is setting the aluminum and lime are reacting to form a gas, I believe hydrogen gas (I'm not sure of the reaction or where the hydrogen comes from, but this is what I was told). The gas forms small bubbles which cause the concrete mixture to rise, much like a cake. The mixture sets about the time it rises and so its density is reduced by these gas bubbles. This block is allowed to cure for awhile and then it is cut into appropriate sized pieces. Then it is steam cured in an autoclave for a

very long time. When it comes out of the autoclave it is allowed to dry and it is packaged and sold.



Autoclaves for Ytong

Making Ytong requires a multi-million dollar investment but because of the economy of scale the finished product is actually quite inexpensive, about \$50 per cubic meter.

Ytong is used extensively as a building material. There are different grades and types of Ytong for different uses, some metal reinforced panels are used structurally for flooring and roofing but mostly it is laid up like blocks or bricks to make walls. Its advantages in building is that it is light weight so less structure is needed and it is insulative.



The house on the right is being finished with Ytong and the house on the left with hollow clay blocks.



Ytong is easy to cut and drill yet it is tough.



Here is Osgul's Turkish tea stove.



We decided to make a few stoves and test them out.





Ytong makes wonderful stoves and combustion chambers. There is only one small problem. It doesn't hold up to the high temperature.



After a few fires this cracking developed. Maybe if separate segments were used it wouldn't crack radially like this. No ceramic likes to expand and contract without proper expansion joints. Notice how clean this combustion chamber remains due to good, insulated combustion.



This test kiln was made from Ytong scraps and used to fire clay ceramic test discs.



The inside of the kiln after the first firing tells the tale. The Ytong will not hold up to the high temperature.



This sample exposed to high temperature developed serious cracking and became weak.

All of this said, I would rather make the combustion chamber from Ytong than from sheet metal!

Also, Ytong makes fantastic insulation. Bored to a bigger diameter and lined with a ceramic cylinder liner for a hot face, a very good stove might be made. Also Ytong might work well as insulation under the plancha, after the hottest combustion gasses have cooled a little.

So don't go out and buy stock in an Ytong factory just yet. Several interesting ideas could be pursued, however. Making refractory clay ceramics foam, using aluminum powder and quicklime, and getting it to set somehow (the C word). Or some sol gelling somehow? Please send me a full report if you beat me to it.

More information can be found by Googling Ytong, aerated concrete, autoclaved aerated concrete, Hebel autoclaved aerated concrete. Ytong was made in Florida for awhile but the factory went bankrupt. The Ytong promotional literature says that it is now made in Texas. It is made in many countries including Mexico.

Best of luck with all of your endeavors and keep on experimenting!

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