

Blow Dryer and Red Brick Aluminum Forge

by [egbertfitzwilly](#) on January 9, 2010

Table of Contents

Blow Dryer and Red Brick Aluminum Forge	1
Intro: Blow Dryer and Red Brick Aluminum Forge	2
Step 1: Bill of Materials	2
Step 2: Laying the groundwork	3
Step 3: Assemble the firebox and chimney	4
Step 4: Arthur Miller where are you?	4
Step 5: The blow dryer assembly	5
Step 6: Assembling and Charging	5
Step 7: Smelting and Casting Aluminum	6
Related Instructables	7
Comments	7

Intro: Blow Dryer and Red Brick Aluminum Forge

A charcoal forge for casting aluminum electrodes and casings can be made from a blow dryer and some clay bricks. Aluminum scrap comes in a variety of forms, mostly involving impurities of one form or another. This scrap can be reduced to (more or less) pure aluminum oxide (what we commonly call aluminum is actually aluminum oxide) by smelting it and removing the impurities which float to the top. The molten metal can then be cast into forms which are convenient for use in low and medium voltage al-air or al-oxide energy generation systems as well as other casting applications.

Unlike many other forges this one can be reasonably used in a residential environment without attracting undue attention from the neighbors. It's not particularly noisy and doesn't project huge fiery jets. It doesn't require permanent construction or a specialized installation. It can be put together, used and torn down in a single afternoon.



I really like many of the propane designs I saw but most people don't have a propane burner or nozzle assembly to spare so I decided that design which leveraged existing BBQ technology would be more widely useful.

The mandatory note: I believe the insurance company add that says 25 burned down their houses attempting to deep fry turkeys. Don't be an idiot.

No blow dryers were injured in the making of this instructable if would be nice if folks who tried this exercised great care and caution and no humans get injured in trying to do this.



Step 1: Bill of Materials

As promised in the title the key ingredients are common red clay bricks and a household blow dryer.

You'll need:

23 ordinary red clay bricks. I had some used brick laying around but new brick from Home Depot costs about 17 cents each. You can get firebrick if you want (I didn't). The concrete bricks would probably be okay but I can't speak to that.

An ordinary blow dryer. You can pick up a cheap one at Walmart or Target for around \$15 or you can use one that you have. It will not be damaged or changed in this process.

A coat hanger

A BBQ grill at 18 inches in diameter. When all was said and done I used the top grill from my Weber, you will learn more about this decision in the next step.

Charcoal or biochar briquets, the charcoal must be sufficiently formed to rest on the fire grill.

A 30oz steel can. I happened to use Rosarita Refried Beans, this is a standard super market can size and almost any 30oz can should do. A small size may be used but for this design the 30oz is approximately the largest size that can be accommodated.

A catalog or magazine, preferably with slick, glossy pages (clay paper). We actually only need one page from it which will be damaged in the process.

<http://www.instructables.com/id/Blow-Dryer-and-Red-Brick-Aluminum-Forge/>

A long handled tea spoon or small ladle for removing slag.

Masking tape

A 1 foot or so piece of steel pipe of approximately the same diameter as the blower tube on the blow dryer is convenient. Different diameter pipe may be used but if so a smaller diameter should be chosen.

A 2 foot or so wooden stick or pole that can be used in handling the crucible.

A can opener. I didn't show all the tools needed but I'm showing off the fancy, shmancy one I have...

Okay now if we've got all the bits together let's make a furnace...



Step 2: Laying the groundwork

Here you see the foundation of the forge. The forge should be placed on open ground away from burnable material. It doesn't radiate substantially heat but could easily catch the grass on fire, that sort of thing. The best thing would probably be a bed of sand if you have some.

The bricks are layed out to create an air chamber the size of, well, one brick. The pipe fits loosely between its guide bricks and will be removed temporarily in a later step.

This assembly serves to isolate the forced air feed (blow dryer) from the heat of the fire. Since heat goes up the air feed and blow dryer are placed below the burn chamber. This, in combination with the forced air assembly insulation seems to protect the device adequately.

Note how the pipe just projects into the chamber. I experimented with various things and it seemed like this assembly got the most even air flow through the firebox.

This layer will also hold the fire grill. The firebox sits above the air chamber and the grill used to hold the charcoal in pace. My grill had a supporting wire rod running down the center so you can see how I used the recess created by the pipe and the gap between the two bricks in the back to so that it lays flat and doesn't get bent by the weight of the bricks above. I used a grill big enough so that the outer wire supporting rod didn't impact the forge. Everything used in the forge should return more or less to its original purpose.



Step 3: Assemble the firebox and chimney

By placing the grill so that it sits level there is a solid foundation that will hold the balance of the stack. The bricks are placed in the traditional alternating layers (see intro picture for details) As you can see from the intro picture I used 3 rows on top of the grill when seemed sufficient for my porpoises.

The chamber will hold the burning charcoal and crucible which we will make in the next step. The size of the melt chamber can be varied and performance will vary in a large part based on the air capacity of the input feed device (blow dryer or other device).

Now that we've got the furnace in place let's quickly put together the crucible which will hold our feedstock.



Step 4: Arthur Miller where are you?

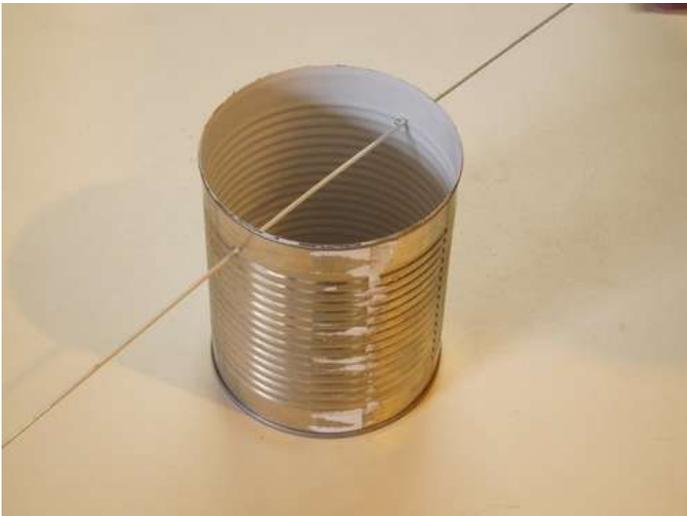
There's never a crucible when you need one. Take the 30 oz can of whatever, open the top and remove the contents. Take off the labels, wash the can thoroughly and allow it to dry. I suppose that part might seem obvious but one never knows....

Now I happen to have...okay, my wife has, this really cool can opener that removes the lid and the top seam so that the can has a tidy and much safer edge. If you do not have such a wondrous device then take a file and file down the inside edge of the can to obtain a smooth lip.

Take the coat hanger and clip off the long straight section across the bottom. Now take your drill and drill two 1/4 inch holes across the diameter of the can. This need not be exact but should be pretty close.

Push the piece of coat hanger through the two holes. Take the remaining coat hanger piece and bend the two shoulder bars down so that it forms a long hook. When we are forging aluminum this hook is used to remove the crucible from the fire by placing it under the wire rod and lifting the crucible from the furnace. It also forms a pivot point so that the aluminum can be poured into the mold.

Okay, now that we've established our place in literary history let's put together the forced air blower



Step 5: The blow dryer assembly

The most important thing, other than don't injure anyone or burn your house down, is don't damage the blow dryer you scrounged. So we attach the blow dryer to the air feed by means of a paper strip and some masking tape. This isolates the blow dryer a large portion of the heat transfer and when you're done the tape can be removed and the blow dryer returned to its usual purpose no harm, no foul.

Remove the pipe from the furnace. Arrange the blow dryer and the pipe so that they sit level. In my case blow dryer had protusions on both sides and I had to put a cloth under the pipe so it would sit level.

Take a page from the catalog or magazine and fold it into halves or thirds until it forms a strip a couple of inches wide. This will be used to connect the pipe to the blow dryer without a physical connection. That will reduce opportunities for heat transfer. Additionally the paper serves as an early warning indicator if heat is present, then the blow dryer can be turned off and the assembly removed from the heat to safety.

Tape one strip securely between the two tubes (blow dryer and pipe, see picture). Wrap the strip tightly around the joint several times then tape it securely at the ends. The paper tube now forms a surprisingly strong joint between the two devices to create a single apparatus.

Okay, now we're ready to put it all together and melt something....



Step 6: Assembling and Charging

Take the forced air assembly back to the forge and insert the tube to approximately the same location as it was during initial assembly.

Place the blow dryer so that its air intake is away from dust and dirt. A small towel or piece of cloth can safely be laid under the blow dryer to provide an even safer environment. The towel will get dirty so there's no free lunch.

Place a few rows of charcoal on the fire grill until you fill up the gap created by the first row of bricks.

At this point if you hang the crucible in the fire box chamber it should fit nicely with the bottom of the crucible just above the charcoal. The crucible should hang freely in the furnace chamber and not rest on the charcoal itself.

Preparation of the feedstock depends on what you're using. I used soda cans so I cut the tops and bottoms off using a pair of scissors (not the good ones!) and then smashed the remaina tube flat and folded it a bit. This allowed me to feed in the body seperately from the tops and bottoms.

There is much advice on this, however what I found is this. Cut up a bunch of small pieces and place them in the crucible. When things heat up this melt they will form a pool of molten metal. This will take much larger pieces conveniently. There are limits to this but you can think of preparing feedstock in much the same way as preparing a campfire. First comes the tinder, then the small logs, then bigger logs.

Okay, now we've got a furnace, we've got a loaded crucible lets smelt some aluminum...



Step 7: Smelting and Casting Aluminum

Okay lets get started with the smelt. Leave the blower turned off until the coals are established and have some grey ash on the surface. Turning the blower on prematurely will blow the fire out however once grey ash appears on several bricks the blower will greatly enhance the process from then on.

If you use on those charcoal starter devices with newspaper or whatever get your coals started. Otherwise remove the crucible and spray on a good dose of starter fluid. No need to go crazy, it won't help. Use the same sort of amount you would use the start the charcoal in your grill.

Light the charcoal and, holding the crucible the extended rod ends, place the crucible back into the furnace. ****CAREFULLY**** drop in additional briquets up to about the level of the crucible rod. Don't over pack, you can always drop in more briquets later.

Take the last two bricks and place them ****CAREFULLY**** on top of the furnace to form a chimney. They should be placed so that the center of the furnace forms a square framing the crucible. (see picture)

As things heat up the feedstock will begin to soften and then melt. As the metal melts additional feedstock can be ****CAREFULLY**** added to the crucible. Eventually you will have either fed in all your feedstock or the level in the crucible will be "full". I wouldn't overfill the crucible, if it gets half full go with that until you a clear idea of how exactly things will go.

Dross and slag will float to the surface of the molten metal. I removed this using a long handled tea spoon. (see picture).

Once you have a nice crucible of silvery molten metal (more or less) remove the two chimney bricks from the top of the furnace. Hook the crucible rod with the coat hanger hook and lift the crucible out of the furnace. Tilt the crucible to pour the aluminum using the wood piece to lift the bottom (see picture), this approach provides pretty good control on the pour.

In this case I used a muffin tin as the mold. It was handy, worked and readily discharged the aluminum ingots in an interesting muffin shape (sort of). As you can see from the picture I've done two melts with this and didn't actually get a full muffin because I ran out of feedstock.





Related Instructables



Waste-Oil Forge and Foundry by notjustsomeone



Build a foundry and sand-cast aluminum. by Fenris The bbw



Coffee Can Aluminum Foundry by 2k4u



Identify Metals by tranox



Press Aluminum Cans into Ceiling and Wall Tiles by robtoberfest



How to make a mini forge out of an Altoids tin by steampirate

Comments

50 comments

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cowscankill says:

The use of the grill cover is brilliant. I think this is going to be the design for the forge I am building. I don't have the resources for concrete, bricks will do fine.

Mar 4, 2011. 10:31 AM [REPLY](#)



egbertfitzwilly says:

Thank you for your kind words. I look forward to hearing more about your project.

Mar 5, 2011. 10:15 AM [REPLY](#)



cowscankill says:

I tested the design today and was able to heat treat two knives! It's great, thanks for the post :D I also manage to melt aluminum in it, so I plan to do a lot more in the future.

Mar 5, 2011. 4:47 PM [REPLY](#)



Appollo64 says:

This looks really great! But does anybody have any idea on how to make a good mold for casting the liquid metal?

Jan 29, 2011. 6:59 PM [REPLY](#)



egyptfitzwilly says:

There are several instructables for making sand cast molds. Basically a box filled with a combination of fine sand and clay which is packed tightly around a form.

Arguably the cheapest and easiest cast.

Feb 11, 2011. 9:02 AM [REPLY](#)



afartinthewind says:

I have a old cast iron stove i use to melt Al. I cut a old Co2 tank for a pantball gun in half and use that as a crucible, its high carbon steel with 1/16" walls and when I pre heat it to a deep red (and dont overheat the Al) I dont get any sticking and minimal slag. i just welded 3 legs@2" on the bottom and a "U" shaped handle for pouring on the top. gave it a football shape in a vice and good to go. it can hold about 3 cups no problem and can hit a good yellow hot without damage. By far the easiest to make and most durable crucible i have ever used.

Dec 12, 2010. 11:40 PM [REPLY](#)



masoon says:

what setting did you have your hair dryer set to? Did you let the charcoal burn awhile before using the blow dryer. If I use unheated air will that work?

Oct 30, 2010. 8:22 AM [REPLY](#)



egyptfitzwilly says:

Yes, any forced air source (such as the blower output from an old fashioned rug vacuum) will work. I used the cool setting on the hair dryer, its add no value as a heat source.

The more air that gets forced in the higher the temperature. Its not clear how hot this particular can safely get before the bricks begin to crack or the steel can crucible begins to soften and defrom.

I light the charcoal as one would a BBQ grill, when the flames had died down and grey ash begins to appear turn on the blower.

Oct 31, 2010. 6:51 AM [REPLY](#)



tomtortoise says:

Yo im wondering if the can is going to melt holding the aluminum

Oct 6, 2010. 7:59 AM [REPLY](#)



egyptfitzwilly says:

It hasn't yet.

Oct 12, 2010. 8:42 AM [REPLY](#)



Firestorm_101 says:

I have just had a brilliant idea! I hope its brilliant anyways... I got to a technical career school for computer, and in another class on the other side of campus is a machine tool shop with several lathes and the like. I know they get there Al peices from a factory that tosses the pieces out as scrap, being they must be a uniform size in there machines. I doubt they will give it up to me, but the machine tool shop in the school is going at is constantly, could the Al shavings from the lathes be used for this setup?

Sep 29, 2010. 10:51 AM [REPLY](#)



egyptfitzwilly says:

Actually I'd suggest you take the class, the ability to do basic machining such as milling and lathing will serve you well all of your life. Casting is just the first step, virtually anything useful will require additional machining. Plus you'll have access to a larger body of folks who can help making useful things. Trust me, they will want to get sand casting done as much as you want to do it!

Oct 1, 2010. 4:05 AM [REPLY](#)



Firestorm_101 says:

I know, I ask too many questions before anyone can answer, but another question as well.. Ive noticed in some videos they quench there Al molds, is that necessary?

Sep 30, 2010. 7:57 AM [REPLY](#)



Firestorm_101 says:

I have 2 minor questions. Is Al Slag good for anything at all? And could I use and old cast iron pot? I have one that's about 6 inches tall, and about 5 inches in diameter, complete with a sturdy handle that could be easily hooked. Its even complete with a small pour lip on it. The only thing I'm concerned about is, being its so old, its not smooth metal, its rather ripply and bumpy. I don't know if that's normal with old cast iron, or if its rust deposits or what. I look forward to your reply, and great ible.

Sep 24, 2010. 6:26 AM [REPLY](#)



egyptfitzwilly says:

I have no idea how one might use the slag. The cast iron pot should be suitable as a crucible, the only requirement is that the crucible material has a higher melting point than the fire. There is always some aluminum left in the crucible (at least in mine) so you'll end up with an aluminum lined cast iron pot. Which is fine as long as you only want to use it for aluminum....

Sep 24, 2010. 6:30 AM [REPLY](#)



Computothought says:
Cool. Have to try this with my heat gun.

Sep 19, 2010. 8:06 AM [REPLY](#)



egbertfitzwilly says:
You mean as the blower or the heat source? I don't think a heat gun will generate sufficient temperature to be useful but would probably make a dandy blower.

Sep 22, 2010. 9:02 AM [REPLY](#)



Computothought says:
Your probably right though the extra heat could not hurt. I can always go to Goodwill and get a cheap hair gun and not wear out the heat gun..

Sep 22, 2010. 9:16 AM [REPLY](#)



moonchylde says:
Cold air is denser and thus has more usable oxygen. Hot air is just a waist of electricity.

Sep 22, 2010. 4:55 PM [REPLY](#)



0087adam says:
could wood be substituted for the charcoal?

Aug 2, 2010. 1:51 AM [REPLY](#)



egbertfitzwilly says:
Yes, I believe so but it creates some challenges. For instance I'm not sure a blow dryer will generate sufficient air flow for heat or how much wood you might need to use. You could certainly make the wood into biochar and use that.

Aug 2, 2010. 2:09 PM [REPLY](#)



FlyingMuffinsAndVampyreBats says:
this works very nicely.
melted down some aluminum crutches that were taking up space.
only problem, i burned a hole through the bottom of my can, leaking all my molten Al out, leaving only the "dry" clumpy slag in the can.
any idea why this happened, and how to prevent it?
i can only guess that i didnt add the metal fast enough...

Apr 19, 2010. 1:11 PM [REPLY](#)



egbertfitzwilly says:
It sounds like you melted your can. Or possibly it just softened up enough and you poked through it while adding bits of the crutch. I've never had this happend but I rarely do more than a bag of cans at a time and these are prepped.

Apr 20, 2010. 3:38 PM [REPLY](#)

Did you use a bigger blower? The more air you put in, the hotter the furnace burns. Its not impossible that you actually melted the can, particularly if it wasn't steel but some other alloy.

You might try again with smaller (or lighter pieces). And don't overlook the value of an actual crucible. My can crucible is expedient but, as you saw, it has drawbacks.



scryptopower says:
If you run the furnace with too much air, it oxidizes the alu and steel rapidly causing it to burn through. Use as little air as possible.

Jun 21, 2010. 9:45 AM [REPLY](#)



marshon says:
This is so simple and very cool.
I bought a job lot of 50 REALLY old 540Mb (yes Mb!) hard drives £10.00 the lot for the bearings. Now I have 50 really high quality aluminium alloy castings that were the bodies.
Should get a better yield from them than soda cans.

May 3, 2010. 5:33 PM [REPLY](#)

Also I have a plain stainless steel bathroom cup which might form a more robust crucible. I must give this one a go.



egbertfitzwilly says:
I like the cup idea. I bet Ace or OSH will have dozens of small steel cups for various purposes. Possibly also Target and Walmart in the housewares department.

May 16, 2010. 5:44 PM [REPLY](#)



The Ideanator says:
I plan on using a leaf blower for my air intake, I'm also thinking about adding a fuel drip(gas, kerosene, or other petroleum distillate) in the air pipe.

Apr 18, 2010. 3:12 PM [REPLY](#)



egbertfitzwilly says:
With that kind of pressure you might consider a Babington nozzle with a kerosene drip. That would keep your sump pump costs down and give you sufficient heat to smelt a whole lot more than this little furnace can do..

Apr 18, 2010. 8:54 PM [REPLY](#)



The Ideanator says:

I probably won't do a fuel drip because i only need to get my furnace up to about 1400-1500 Fahrenheit

Apr 20, 2010. 1:49 PM [REPLY](#)



egbertfitzwilly says:

Ace hardware has some nice burners, particularly if you wanted to do a propane feed.

Apr 20, 2010. 3:41 PM [REPLY](#)

Something like this (not recommending the vendor, just a google hit) could be readily adapted to your leaf blower nozzle with standard propane hose running through it.

<http://www.shop.5-0bbq.com/High-Pressure-Cast-Iron-Burner-BG12.htm>



Nesbitt11 says:

has anyone had problems breathing while doing it? i researched it and it ays that its supposed to irritate your lung

Jan 16, 2010. 4:40 AM [REPLY](#)



egbertfitzwilly says:

Don't do this indoors...

Jan 16, 2010. 10:43 AM [REPLY](#)

What you are referring to is the risk associated with galvanized pipe in the traditional "coffee can" forge.

In this design the pipe doesn't get very hot at all fit is located below the level of the firebox (heat rises) and cool air is being pumped through it.

In the event that pipe does begin to heat up considerably the paper connector will burn first and the air feed will drop significantly lowering the temperature inside the forge.

It is, of course, an extremely bad idea to breath the exhaust fumes from something burning at several hundred degrees. The heat alone is sufficient to cause damage without the introduction of any other bits.



--= Excogitate =-- says:

Huh... is it bad to use galvanized pipe? I just made a smelter with some and was about to use it tomorrow for the first time. Any tips regarding safety?

Jan 16, 2010. 11:30 PM [REPLY](#)



The Ideanator says:

The only problem with that would be the risk of what welders and other metal working people call "metal fume fever". Its not deadly, it just makes you feel sick.

Apr 18, 2010. 3:06 PM [REPLY](#)



egbertfitzwilly says:

I believe most of the designs I've seen recommend against the use of galvanized pipe due to the production of dangerous gasses. As noted above I don't think that's a significant risk in this design but I recommend that you avoid the use of galvanized pipe because of the potential danger.

Jan 17, 2010. 8:33 AM [REPLY](#)

If the galvanized pipe begins to smoke or emit vapors do not breathe the fumes and use your fire extinguisher to immediately put out the fire.

Also keep in mind that depending on the feedstock used the presence of alloys, paint and other contaminants may also produce noxious vapors. Always do this outdoors in an extremely well ventilated area and stay upwind of the forge.



stormende says:

Huh?

You are NOT supposed to breathe the fumes!
Unless they are from green stuff. Keep it Eco!

^^

J/K

Jan 16, 2010. 9:33 AM [REPLY](#)



history323 says:

That is amazing! Thanks for the great instructable! I am going to make one this weekend!!

Mar 26, 2010. 8:40 PM [REPLY](#)



Nesbitt11 says:

Does anyone know the maximum temperature that this forge reaches? i was wandering whether i could use it for iron and steel.

Jan 10, 2010. 10:39 AM [REPLY](#)

Irons melting point is 2750 degrees F
steels is 2500 degrees F

any information is appreciated :)



wargoth says:

Mar 18, 2010. 12:03 PM [REPLY](#)

Assuming you are using coal as a fuel, and your air source is flowing pretty good, the temperature of this fire will be in the ballpark of "really goddamn hot"...

LOL... For those not familiar with the Ancient Artifacts Forge scale of temperature measurement, that is in the neighborhood of 5000 Farenhiet if my failing memory serves me correctly.



egbertfitzwilly says:

Jan 10, 2010. 7:42 PM [REPLY](#)

Temperature will be a function of 3 things, maximum temperature of the fuel, air flow into the fire chamber and insulation of the furnace.

Steel is smelted with coal so I think you're okay there. You may need a more powerful blow dryer or squirrel fan to force in more air, you'll need a better crucible and you probably want to use firebrick instead of red clay and further insulate your furnace with dirt piled against the sides.



TallTrav says:

Jan 10, 2010. 10:37 PM [REPLY](#)

The hair dryer works fine. There are plenty of backyard blacksmiths that have McGuyvered a forge together using a hair dryer to be the bellows. I've use a small riveting forge to do plenty of blacksmithing and a hair dryer would be a welcome addition as you'll be free to do other stuff while things get up to temp. You'll be fine Nesbitt....enjoy!



stormende says:

Jan 13, 2010. 5:11 PM [REPLY](#)

This is AWESOME!
It is so simple but yet effective, thankx!



rimar2000 says:

Jan 10, 2010. 12:13 PM [REPLY](#)

This is GREAT!

I thought I was the ace of improvisation, but this has left me stunned.

Just yesterday I could not cement a wood bite I did, for not have a forge. I am ashamed!



egbertfitzwilly says:

Jan 11, 2010. 1:35 PM [REPLY](#)

Apparently it wasn't good enough to get featured, always a disappointment...



rimar2000 says:

Jan 11, 2010. 2:27 PM [REPLY](#)

I think the issue of qualification is totally subjective and is limited mainly by the time factor.



egbertfitzwilly says:

Jan 13, 2010. 1:02 PM [REPLY](#)

Absolutely agree.



egbertfitzwilly says:

Jan 10, 2010. 7:54 PM [REPLY](#)

Thank you for these kind words, positive feedback means a lot especially from someone with such an impressive list of 'ibles.



mad_scientist says:

Jan 9, 2010. 3:27 PM [REPLY](#)

Could you clarify a bit? In your intro it sounds like you say that aluminum metal (such as a soda can is made of) is actually aluminum oxide. From my experience, aluminum oxide is pesky stuff that forms on molten aluminum when it is exposed to too much oxygen.



egbertfitzwilly says:

Jan 9, 2010. 7:43 PM [REPLY](#)

Actually I can't speak authoritatively to this issue but my understanding is that most commercial aluminum is actually an aluminum oxide, whether or not that is alumina or another oxidant I can't say. I'm certainly willing to be corrected.



t.rohner says:

Jan 12, 2010. 6:52 AM [REPLY](#)

Aluminum oxide is what forms on the surface of shiny (freshly cut) aluminum. It actually forms a skin, that keeps the aluminum from oxidizing further. Aluminum oxide is also known as ceramic...

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