# SCRATCH FABRICATION OF APPARATUS FOR LOCAL ALUMINUM RECYCLING

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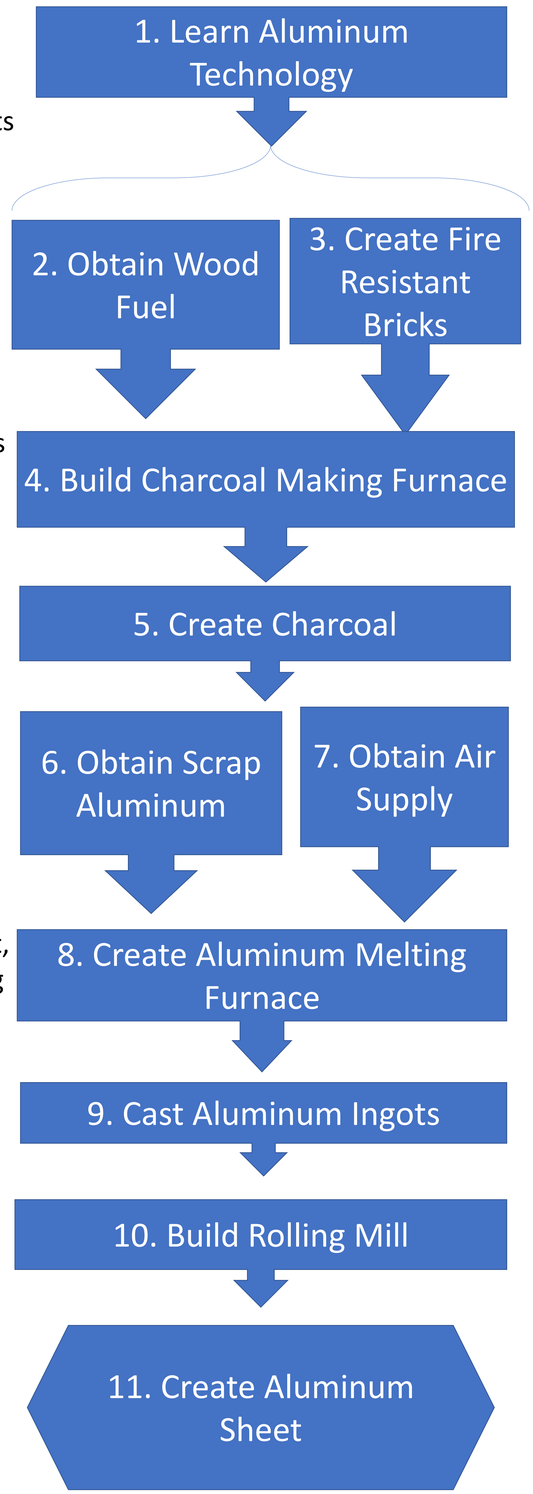
## Abstract

Currently, aluminum metal is derived from bauxite ore which is mined from locations outside North America. The mining of this ore releases toxic elements while the shipping of aluminum immensely consumes fossil fuels. The objective of my project is to create a process for converting scrap aluminum into 1mm thick sheets which is the type of material needed for practical aluminum manufacturing. It was imperative to research and follow safety procedures through this process, such as avoiding aluminum fumes and safely handling hot objects. First, it was necessary to create charcoal (from scratch) to be used as the fuel source by a furnace to melt the aluminum scrap. Once the furnace and fuel source were built, the aluminum melted into consistently sized ingots. These ingots will be flattened incrementally using heated steel rollers (fabricated for this project). The resulting sheets should be strong enough to use in a variety of applications including machinery and building construction. In a future project, I plan to develop a process for extracting aluminum from common clay removing the need for mining/shipping of bauxite and resulting in less pollution.

## Objectives

- Learn the aluminum recycling process
- Convert aluminum scrap into aluminum plate

## Methods




## Results

### Safety Considerations

- Aluminum Fumes
- Aluminum Splattering
- Hot surfaces
- Wear gloves, goggles, multiple layers of clothing
- Work in well ventilated area

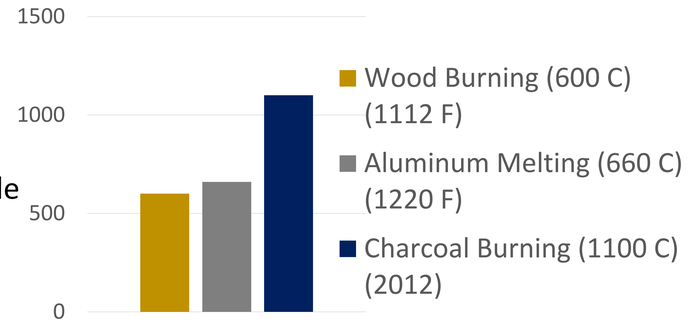



Figure 1. A row of clay bricks next to a wooden brick form. Each brick is roughly 6inches by 12 inches by 2 inches

Figure 2. A clay brick furnace processing wood into charcoal. Wood ash paint was applied to provide water resistance. The soda can is for scale.

Figure 3. An aluminum melting furnace running at roughly half capacity. The inner diameter is roughly 6 inches.

Figure 4. Some example wood next to some resulting charcoal.

Figure 5. Two aluminum ingots below an aluminum droplet. The ingot on the right is held in hand for scale.

Average Percentage of Charcoal yield per pound of Wood = 22%
Pounds of Charcoal Produced per Hour of Burn Time = 0.9 lb. Charcoal/1 hour

## Conclusion

The objectives were to learn, and then attempt aluminum recycling. To do this, I researched online resources, collected raw materials, built the machinery and performed tests to melt aluminum. The results have shown that charcoal can be derived from wood, earthen bricks perform well as furnace material and aluminum melts when heated by burning charcoal. Currently, I have completed steps 1-6 of my procedure and I am currently developing steps 7,8, and 9. In the future, I will continue my procedure as well as develop more ways to measure the effectiveness of my methods.

## References

Aluminum Beverage Can. (2020). Retrieved from http://www.madehow.com/Volume-2/Aluminum-Beverage-Can.html
Aluminum Foil. (2020). Retrieved from http://www.madehow.com/Volume-1/ .html
Grant, T. [The King of Random]. (2014, December 29). Melting Cans With The Mini Metal Foundry [Video]. https://www.youtube.com/watch?v=ISoWxG30rb0
HowItsMadeEpisodes. [HowItsMadeEpisodes]. (2009, January 18). How It's Made: Aluminium Foil [Video]. https://www.youtube.com/watch?v=f4OTj9yNOak&list=PLb8qbxWEaUbfMqYrMawTrkQkL3Ejd6sSX&index=53
Metal Melting Ranges. (2017, September 14). Retrieved from https://www.steelforge.com/literature/metal-melting-ranges/
Munoz, G. (2019, March 2). How Hot Is a Bonfire? Retrieved from https://sciencing.com/hot-bonfire-8770.html
Primitive Technology. [Primitive Technology]. (2016, February 19). Primitive Technology: Charcoal [Video]. https://www.youtube.com/watch?v=GzLvqCTvOQY
Primitive Technology. [Primitive Technology]. (2017, August 25). Primitive Technology: Simplified blower and furnace experiments[Video]. https://www.youtube.com/watch?v=c2ExwOAjLNw
Primitive Technology. [Primitive Technology]. (2017, September 22). Primitive Technology: Mud Bricks [Video]. https://www.youtube.com/watch?v=D59v74k5fIU
Right to Know Hazardous Substance Fact Sheet. (2007, February). Retrieved from https://nj.gov/health/eoh/rtkweb/documents/fs/0059.pdf

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