Coal Carbonization in a Lab-scale Furnace

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Introduction

- Metallurgical or coking coal has plastic qualities allowing it to form coke through carbonization.
- During carbonization, coal is heated to temperatures above 900° C in nitrogen to get rid of volatile matter, melt and solidify again.
- The product of the carbonization of coal is coke which is used in iron production where it is placed in layers between the iron ore to assist in the redox reaction.
- The objective of this research is to produce coke in a lab-scale furnace and to study coke properties.

Method

Sample Preparation

Figure 1 – Sample being ground in mortar and pestle to get particle sizes between 2mm and 0.3mm in diameter

Figure 2 – Sample after being dried in the furnace for 2h at 105°C to remove moisture

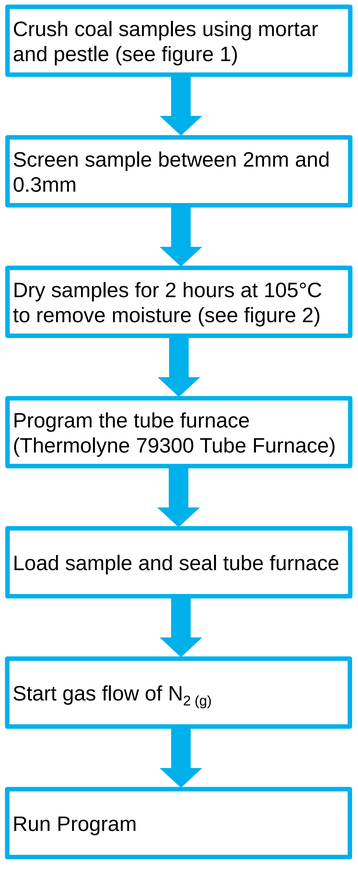

Figure 3 – methodology flow chart

Figure 4 – Lab scale Furnace (Thermolyne 79300 Tube Furnace); the samples are placed inside on the furnace through the side tube. The tube is then sealed and nitrogen gas is passed through. After the nitrogen passes through the furnace it goes through the tubing into the water bath before venting into fume hood.

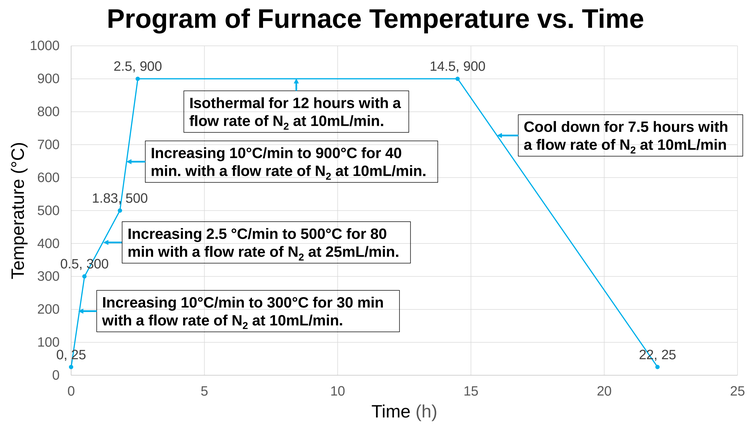

Figure 5 – The program that was used in the Thermolyne 79300 Tube Furnace

Results

Weights of Coal Samples Before and After Carbonization

Sample	GC20ASP	GC20AFC
Tray (g)	2.1486	2.2173
Sample and Tray (g)	6.1476	6.1757
Sample and Tray after Drying (g)	5.8611	5.8801
Calculated Moisture content (g)	0.2865	0.2956
Calculated Sample Weight (g)	3.7125	3.6628
Product and Tray (g)	4.3514	4.4578
Calculated Product Weight (g)	2.2028	2.2405

Table 1. Weights of coal samples during different parts of the carbonization process

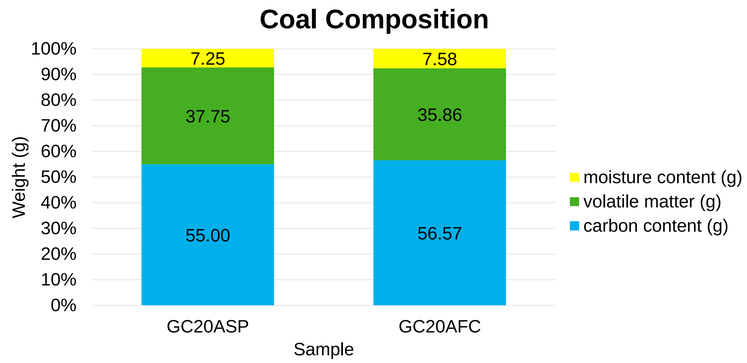

Figure 6 – The composition of the original coal samples calculated by the weight loss

Coal Sample	Carbonized Product (%)	Volatile Matter (%)
GC20ASP	59.33	40.67
GC20AFC	61.17	38.83

Table 2. Percentages of coal composition

Conclusion

- Coal was successfully carbonized to prepare coke in lab-scale furnace.
- The GC20ASP gave a percent yield of 59.33% and the GC20AFC gave a percent yield of 61.17%.
- Further tests on coke strength are to be carried out.

Figure 7 - coke

Acknowledgements

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Works Cited

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