ANALYSIS OF X-RAY IMAGES OF COAL USING IMAGE PROCESSING

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Abstract : Coal is highly heterogeneous in nature , & for this reason several analytical techniques are needed for its characterization so as to accurately predict its behavior during conversion processes such as combustion , gasification, or liquification. Conventional analysis are unable to describe adequately the impact of coal quality on conversion efficienes and plant performances.There are various methods available for the analysis of coal like petrographic analysis, analysis using chemical methods , differential thermal analysis , X-ray fluorescence analysis, neural network based analysis and so on. The methods available are generally used for analysis of ash contents and mineral contents in coal. In this paper, a new approach to analyze the coal using Image processing technique is discussed.

Index Terms : X-ray , histogram, coal, equalization, thresholding, pixels,

1. INTRODUCTION

Coal is very complex in nature .Coal is a solid but brittle carbanaceous black sedimentary rock that burns. It is made up of carbon, hydrogen , nitrogen , oxygen and some other trace elements like mercury , zinc, sulphur,etc. Much of world's coal contains hazardous concentrations of mercury and sulphur. So, coal fired power plants are the largest source of mercury emissions which is hazardous to health.

Also, the ash problems in coal fired power plants results in decreased efficiency and equipment failures. The assessment of impact of ash on power plant performance is extremely complex and difficult due to coal variability. The impacts of ash on the overall performance of coal fired power plants includes fireside ash deposition , corrosion of boiler parts , slag floe maintenance and production of fine particulates that are difficult to collect.

Taking this into consideration , it becomes necessary to analyze carbon and ash contents of coal before its utilization.

In this project, we used the image processing technique and analyzed the coal by taking its X-ray images.

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2.ALGORITHM

The steps for analysis are as follows:

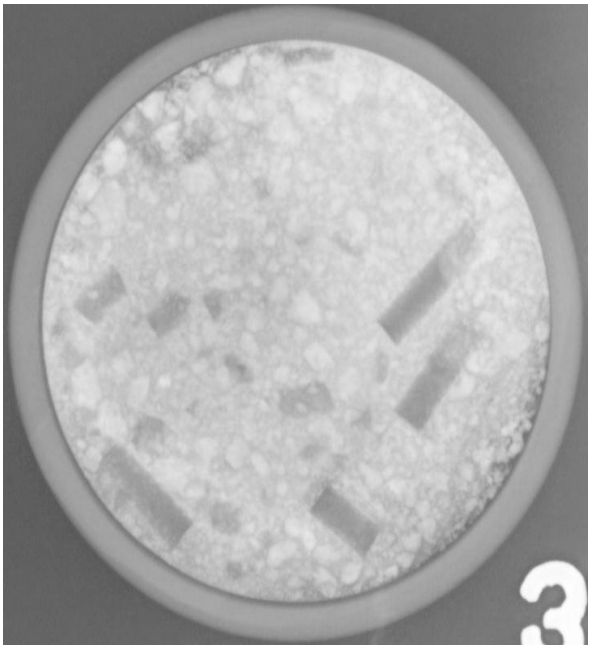
1. Take the X-ray image of coal sample.
2. Convert the image to gray scale image.
3. Plot the histogram equalization graph of image and display the image
4. Find out the appropriate thresholding level from graph.
5. Count the number of white and black pixels from thresholded image .
6. Calculate the ratio of white Vs black.

*3.*RESULTS :

3.1.Sample 1

It has carbon content of 80%

Its X-ray image is:

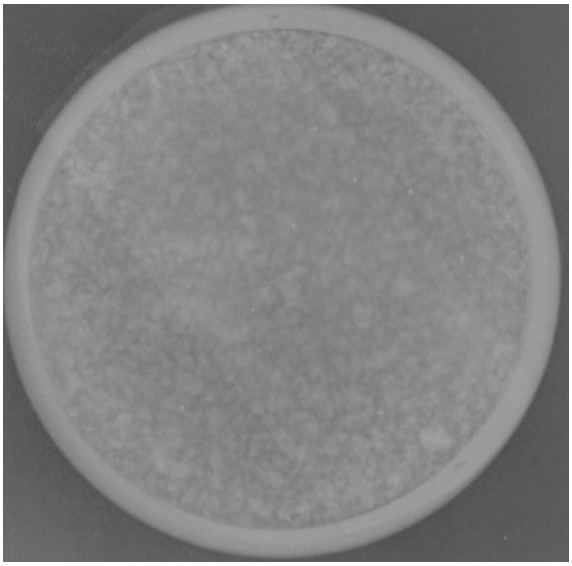


Ratio of W/(W+B) = 0.7697

3.2. Sample 2

It has carbon content of 40%

Its X-ray image is:

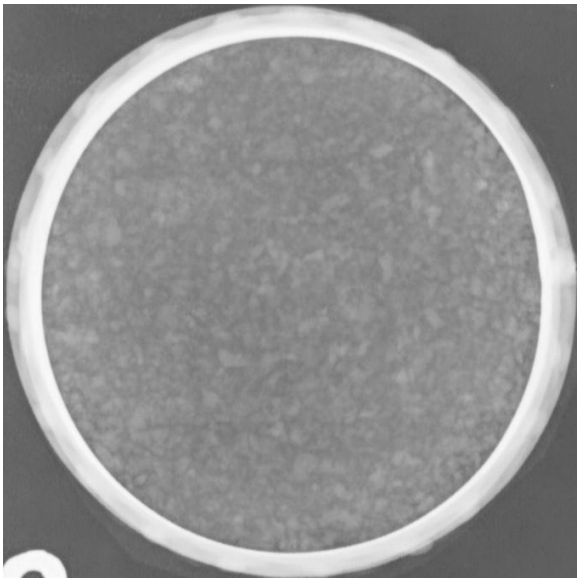


Ratio of W/(W+B) = 0.5846

3.3. Sample 3

It has carbon content of 37%

Its X-ray image is :

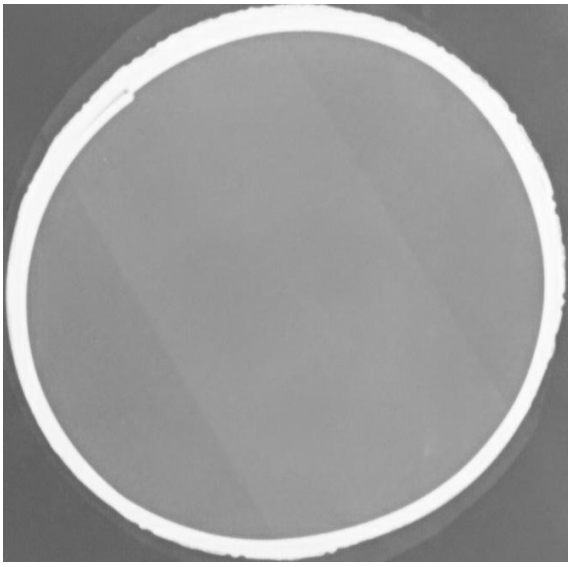


Ratio of W/(W+B) = 0.5584

3.4. Sample 4

It has carbon content of 29%

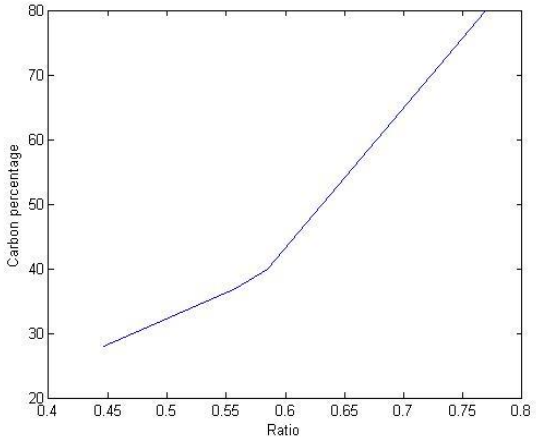
Its X-ray Image is



Ratio of W/(W+B) = 0.0.4462

In above analysis , the samples of coal powder are prepared and width = 0.5cm is kept constant and results are obtained.

The graph is as shown below:



4. CONCLUSION

Using Image processing techniques for feature extraction , the carbon contents of different coal samples is calculated. From the graph , we can differentiate the coal based on its carbon content by knowing its ratio of number of white pixels in image to total number of black and white pixels in image.

5. REFERENCES

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