Investigation on effect of temperature on carbonization of castor leaves

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ABSTRACT

Abstract: The castor oil is used for different purposes i.e. as a fuel and some medical uses since long. At least, all over India people are using castor oil for its cost (cheaper) and having usefulness for faster hair growth in the head, and provide protein for hair to make the long lasting and increasing the strength, softness of hair. Observing its usefulness, the present piece of research work is aimed that producing bio char /carbon compounds, anticipating a high carbon content extraction. The dry castor leaf is collected and again dried and proximate analysis is made; which shows 15.5% of fixed carbon. Carbonization of the dried leaves are made in temperature range 250 °C, 350 °C, 450 °C, 600 °C and 900 °C. The carbonized sample are subjected to FTIR analysis, which reveals the formation and transformation of different carbo and other bonds affected during carbonization. SEM and EDX analysis is made on carbonized sample to find microstructure and elements presents in the char. The C/O ratio is an important factor to study the utility of bio char in the agriculture sector for fertilizer purpose; and the variation of C and O contents with the carbonization temperature is noticed. It is observed that, C/O ratio increases with increasing the carbonization temperature up to 450°C and then with further increase in temperature, decreasing trends in C/O ratio is observed.

INTRODUCTION

Today Biomass is being widely used as an alternate source of energy and various studies has been done in order to use the same as precursor for development of several different products due to growing concerns of exhausting fossil fuel reserves and increasing demand of energy. Generation of large volumes of biomass residue as well as bio wastes occur from different economic activities [1-2]. The usual products of pyrolysis might/could be bio char, tar or pyro ligneous liquor and gases [3].

EXPERIMENTAL PROCEDURE

LEAVES WERE DRIED UNDER SUNLIGHT
↓
LEAVES IN FINE POWDER WERE MADE BY BALL MILL
↓
PROXIMATE ANALYSIS
↓
PYROLYSIS FROM 250^{0}C TO 900^{0}C
↓
CHARACTERISATION OF SAMPLE

RESULTS AND DISCUSSION

Proximate Analysis

The volatile matter, moisture content, fixed carbon and ash content of a particular organic substance can be known using proximate analysis.

The volatile matter present is high i.e. more than 65%. A large amount of volatile matter content in the mixed fuel for biomass provides more stable flame

Proximate analysis of Castor leaf	Wt.%
Volatile matter	65.5
Moisture content	10
Fixed carbon	15.5
Ash content	9

Proximate analysis of castor leaves

Microstructural analysis

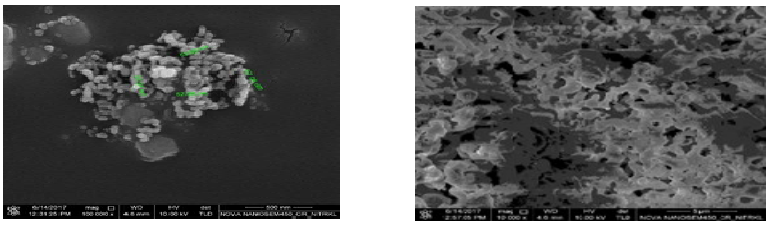
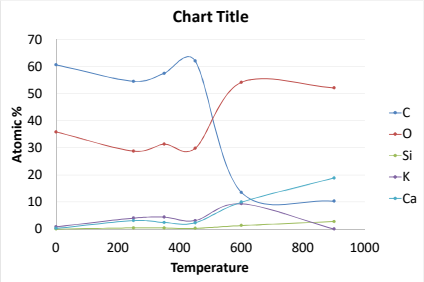


Fig . SEM micrograph for biochar Paralyzed at 600^{0}C & 900°C.

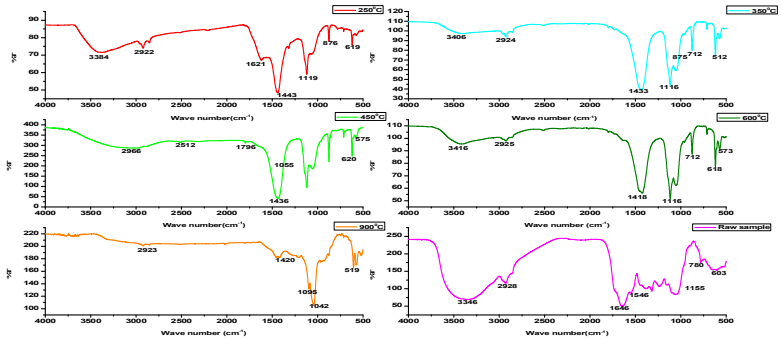
Elemental analysis



It is seen that, the Atomic weight percentage of carbon, oxygen, silicon, potassium, calcium in carbonized sample has been varied with carburized temperature. Overall, the analysis we observe that carbon and oxygen atomic weight percentage is maximum at different temperature

FTIR analysis

The results confirmed the presence of phenols (C-O stretch), alkenyl (C=C stretch), secondary amine (NH bend), aliphatic cyanide/nitrite, methylene (C-H stretch), O-H stretch from hydroxyl group of alcohols, CH_2 rocking, organic siloxane or silicone (Si-O-C) and aliphatic chloro compounds (C-Cl).



FTIR Analysis of all Samples

CONCLUSION

- Thermochemical conversions of biomass are an increasingly viable and efficient way to utilize the biomass as well as the bio waste by-product from it for various energy efficient applications. Bio char is produced by carburizing the castor leaf. The fixed carbon is found to be 15.5%.
- The leaves are paralyzed at different temperatures. With carbonization treatment, amount of carbon content is affected and a variation of other elements such as oxygen, nitrogen, magnesium, silicon etc. was noticed.
- FTIR observations proved the presence of aromatic structures, Si-O-Si stretch as well as bend vibrational modes along with the Si-C peaks in some bio char samples.

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