A Study of Climate Change And Its Mitigation By Nano Biochar

B.Saravana Kumar[1], Mr.C.Arundoss[2]
[1]Dept of Environmental Engineering
[2]Assistant professor
[1, 2] Excel College of Engineering, Salem, Tamilnadu

Abstract- *Global climate change is a burning issue for all over the world. It caused by greenhouse gases and ozone layer depletion. Both are two key space environmental issues of the present decade. All over the world there is growing concern about the far reaching consequences of the continuing build-up of greenhouse gases in the atmosphere and depletion of ozone layer in the stratospheric region of the atmosphere. Climate change in our environment is generated by several causes such as- population growth, pollution from industrialization, urbanization, carbon dioxide from rotting trees, the burning of coal, ozone layer depletion, natural gases and fossil fuels lead to methane travelling into the Earths atmosphere any transportation vehicles, water vapor, and many other little things which contribute to make global climate change even worse*

I. INTRODUCTION

The term "global warming" refers to the increase in the average temperature of global surface air and oceans since about 1950, and to continuing increases in those temperatures. Greenhouse gases, being lighter than air, naturally rise up the outer limits of the earth's atmosphere and then settle there, creating an impenetrable barrier that traps heat from being able to escape into space and warming the temperature.

Another term for "global warming" is "climate change". The Intergovernmental Panel on Climate Change (IPCC) concludes that greenhouse gases are responsible for most of the observed temperature increase since the middle of the twentieth century, and that natural phenomena such as solar variation and volcanoes probably had a small warming effect from pre-industrial times.

MAN MADE OR ANTHROPOGENIC CAUSES

POWER PLANTS

Nearly 40% of our carbon dioxide emissions come directly from the process of burning "fossil fuels" in order to generate electricity. Of that almost 40% of our CO2 emissions directly attributed to generating power, over 90% of it come from the burning of coal. Coal emits 25% more carbon per "unit of energy" than oil and 70% more carbon than natural gas.

AUTOMOBILES

Approximately 1/3 of the carbon dioxide emissions released into our environment comes from the burning of gasoline in internal- combustion engines of automobiles, buses, motorcycles, recreational vehicles, trucks and motor sports. As motor sports (racing) continue to grow in popularity, the huge amount of fuel being used continues to grow annually.

DEFORESTATION

Deforestation is the 2nd most prolific cause of atmospheric CO2 influx. Deforestation is responsible for nearly 1/4 of all carbon emissions entering the atmosphere. The planet cuts and burns nearly 34 million acres of trees each year, including millions of acres of "rainforests".The process of deforestation is "doubly" dangerous for the planet, because not only millions of tons of carbon dioxide is added into the atmosphere each year, but also wiping out the most effective cleansers of that deadly CO2 gas, the trees and plants that naturally "thrive" by consuming the carbon dioxide and offering up pure, clean, breathable oxygen as a free byproduct of the plant life cycle.

EFECTS OF GLOBAL WARMING

- Melting Of Glaciers
- Extreme Weather Conditions
- Affect Food Quality
- Affect Entire Ecosystem
- Affect On Coral Reef
- Affect On Breeding

II. LITERATURE REVIEW

BIOCHAR ON CARBON CAPTURE

Chen Zhang et al (2022)have said that the Carbon dioxide (CO2) capture is critical for emission reduction. Biochar is a promising adsorbent for CO2 capture. In this work, the effect of relative humidity and biochar activation with steam or KOH treatment on CO2 capture was investigated. The results demonstrate that the biochar sample activated by KOH has a high CO2 capture capacity (50.73 mg g− 1). In addition, the biochar after 1.0 h of steam treatment showed a carbon capture capacity of 38.84 mg g− 1 .

BIOCHAR BASED NANO COMPOSITES

Neha Chausaliet al have proposed that the Advanced nanostructured materials like nanobiochar have come up with the sustainable solutions for a range of problems of modern era. In recent years, carbon nanomaterials have been developed as powerful tools due to their unique characteristics and number of applications in various areas like energy, materials, agriculture and the environment, specifically in phytoremediation of various organic, inorganic and heavy metal contaminants. Biochar technology and nanobiotechnology may result in production of carbon-based nanomaterials including nanobiochar and biochar nanocomposites to revolutionize the research in concerned fields. Nanobiochar is nanosized biochar material with better physical, chemical and surface properties.

III. MATERILAS AND METHODS

COLLECTION OF FEED STOCKS

PLANT BIOMASS

Plant *biomass* (W) is the weight of living plant material contained above and below a unit of ground surface area at a given point in time. Production is the biomass or weight of organic matter assimilated by a community or species per unit land area per unit time. Production by photosynthetic organisms, i.e. primary production, may be expressed in two ways. *Gross primary production* (Pg) is the total amount of organic matter assimilated (including that lost in respiration).

ANIMAL MANURE

Animal manure is a well-recognized potential source of a wide variety of infectious agents that can cause disease in humans, directly or indirectly, particularly through consumption of contaminated water or food. Although state regulations and guidance, based on Natural Resource Conservation Service (NRCS) guidelines, are available to assist producers in handling and managing animal manure stockpiles and storage, they emphasize engineering and nutrient management, with some recent attention to air-quality impacts rather than pathogen aspects.

AGRICULTURAL WASTE

Agriculturalwaste are plant residues from agriculture. These waste streams originate from arable land and horticulture. Agricultural waste are all parts of crops that are not used for human or animal food. Crop residues consist mainly of stems, branchs (in pruning), and leaves.[1] It is estimated that, on average, 80% of the plant of such crops consists of agricultural waste.

SEWAGE SLUDGE

Sewage sludge is the residual, semi-solid material that is produced as a by-product during sewage treatment of industrial or municipal wastewater. The term "septage" also refers to sludge from simple wastewater treatment but is connected to simple on-site sanitation systems, such as septic tanks.

PREPARATION OF NANO BIOCHAR

PYROLYSIS

Pyrolysis is most commonly used in the treatment of organic materials. It is one of the processes involved in charring wood. In general, pyrolysis of organic substances produces volatile products and leaves char, a carbon-rich solid residue. Extreme pyrolysis, which leaves mostly carbon as the residue, is called carbonization. Pyrolysis is considered the first step in the processes of gasification or combustion.Temperature during pyrolysis in gasifiers is 250–550 °C (523–823 K), 600–800 °C (873–1,073 K) in the reduction zone and 800–1,000 °C (1,070–1,270 K) in the combustion zone

INSERT NANO PARTICLES

Once pyrolysis process is over, now adding the nano particles

S.No	Compounds
1	Nanometal Oxides and Hydroxides
2	Magnetic Iron Oxides

Table 2: Nano particles

BALL MILLING

Mechanochemical synthesis of nano-biochar by ball-milling technology is gaining attention for the sake of its low-cost and eco-friendly nature. Ball milling as a non-/less-solvent technology can propel environmental sustainability and waste valorization into engineered biochar for advanced applications. Scalable production of biochar nanomaterials with superior properties (e.g., 400–500 m2 g−1 surface area and 0.5–1000 nm pore sizes) enables diverse applications in the field of energy and environment.

IV. RESULTS AND DISCUSSIONS

CO2 ADSORPTION PERFORMANCE USING DIFFERENT BIOCHAR SAMPLES

The CO2 adsorption test using the prepared activated biochar samples was carried out over both 15% and 100% CO2 concentrations CO2. As shown in Fig. 5 (a), the raw biochar (BC-Raw) sample shows the lowest capacity of CO2 capture, which is 10.45 mg g− 1 for 15% CO2 capture and 22.16 mg g− 1 for 100% CO2 capture. The capacity of CO2 capture over the BC-Raw sample is increased over the sample after activation treatment. For example, 15% CO2 capture capacity is increased to 11.44–25.50 mg g− 1 for steam-activated biochar and 20.60–50.75 mg g− 1 for KOH-activated biochar. As expected, the biochar adsorbents show around 50% higher carbon capture capacity in a 100% CO2 atmosphere than in a 15% CO2. The higher partial pressure of CO2 benefits the adsorption of CO2 in biochar [29].

Fundamentally, activation time shows a clear effect on biochar surface texture, and CO2 capture capacities can be affected due to the morphology variation. However, based on the obtained results, the BET surface area, mesopore surface area, and total pore volume are not directly related to carbon capture capacity

V. CONCLUSION AND SCOPE OF FUTURE

The literature has mostly demonstrated the role of nanobiochar or biochar nanocomposites in agricultural and environmental issues. Nanobiochar has excellent sorption ability towards various inorganic and organic pollutants including heavy metals, dyes, drugs etc. Further, nanobiochar has a range of applications in significantly raising plant growth and yield, nutrient recycling, pesticide remediation, fertilizer applications, soil amendment, elimination of the pathogenic effect etc., a phenomenon which is collectively called as “The Biochar Effect” .

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