

A Review on carbon capture techniques

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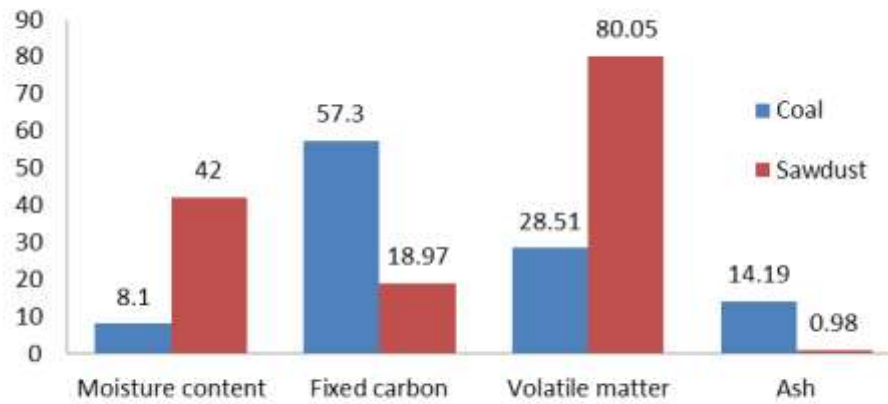
Abstract

The major cause of pollution is industrial source and automobile vehicles etc. and destroying the environment due these emissions. So major amount of gas released from vehicles and industrial sources are toxic gases such as carbon dioxide and carbon mono oxide. The environmental effect now a day's is more in metropolitan's cities in present global scenario. So, there are different technologies to capture CO₂ and that CO₂ can be utilized for other purposes. In this study, recent work on carbon capture is reviewed.

Keywords: Process industries; Carbon capture

1. Introduction

Air pollution is a serious concern nowadays because of the fuel consumption in various process industries and exhausts through vehicles in the entire world. Carbon dioxide gas emission is mainly responsible for air pollution and climate change in the atmosphere in the majority. The unabated outflow of carbon dioxide into the atmosphere from different sources is indicating the alarming situation for the future. Its removal is highly required in large scale process industries during processing operations. The Paris Agreement in 2016, force the entire world to search out effective policies and technologies regarding greenhouse gas abatement. At present existing coal-fired power plants are working using biomass as fuel in blended form with coal in a certain quantity. Proximate and ultimate analysis of coal and sawdust have been compared as shown in fig. 1 and fig. 2 respectively. So, there are number of biomass options exist and its use in process industries may reduce the level of greenhouse gases in the environment.



.Fig. 1 Proximate analysis of coal and sawdust

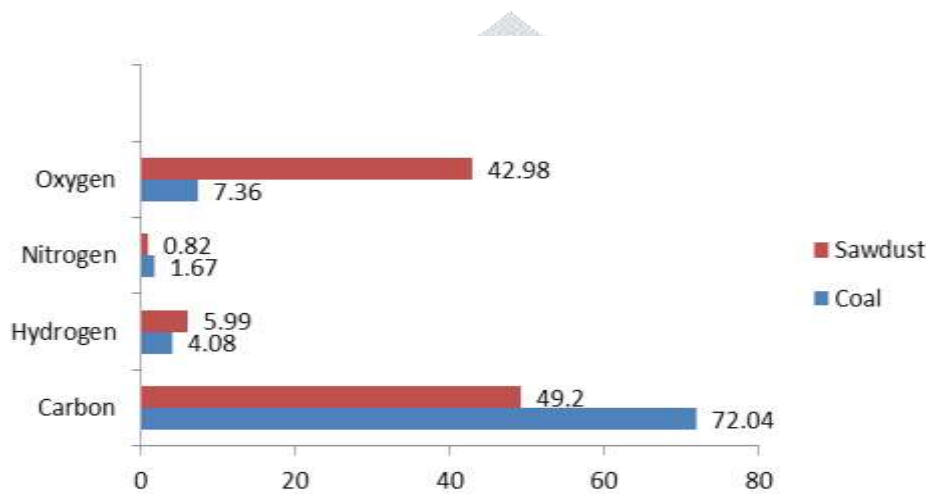


Fig. 2 Ultimate analysis of coal and sawdust

2. Techniques for Carbon dioxide capture and sequestration (CCS)

Carbon dioxide capture and sequestration (CCS) is a process that comprises the set of various technologies to stripped out CO₂ from various process industries like coal and gas-based power plants. There are many technologies can be applicable nowadays like liquid solvent, chemical looping. Three basic techniques used to capture carbon dioxide viz. Pre-combustion, Post-combustion and oxy-fuel combustion. At present, environmental pollution is a big challenge for the entire world. CO₂ emissions in the atmosphere through process industries are increasing rapidly. Now a day's population growth and its requirement to fulfill their daily needs increasing at a rapid rate and to satisfy there need they uses vehicles, household products and more over electricity. The role of vehicles is also playing a crucial role in environmental pollution because of CO₂ emission in the atmosphere. So, the reduction in CO₂ level is highly required in the present scenario. Now-a-day's lot of research is going on to capture CO₂ which is the main source of pollution in atmosphere. Some techniques to capture CO₂ such as post combustion, pre combustion, oxy-fuel combustion process are in process. Post combustion CO₂ capture using chemical process is most efficient and its efficiency is around 90%. The present work proposes the use of hybrid solvent to capture CO₂ using

packed column. This facility will help to analyze the CO₂ capture on lab scale through a prototype experimental set-up. At present, environmental pollution is a big challenge for the entire world. CO₂ emissions in the atmosphere through process industries are increasing at a rapid rate. Now a day's population growth and its requirement to fulfill their daily needs increasing and to satisfy these needs they used vehicles, household products and consume electricity. According to the Paris summit, India committed that by 2020 they would reduce emission about 30%-35% [2]. The CCS system (carbon capture and storage) is a rising technology to reduce greenhouse emissions. The various new approach and application are made to reduce greenhouse gases according to Paris settlement on the fourth of November 2016 [3]. Due to this agreement, renewable energy resources are going to be promoting by various nation government with the implementation of subsidy offered to customers. It will also help in to reduce emissions in the environment. The current report of the International Energy Agency (IEA) stated that CO₂ emissions are gradually increasing in the present scenario and is approximately 32.3 Gt occurring from fossil fuel. The various decision making and optimization models were reviewed to capture CO₂ [4]. The new approach to capture CO₂ has been also developed. In the recent developments, different types of hybrid process to capture CO₂ such as absorption type, adsorption type, membrane type, cryogenic type and hydrate chemical looping combustion has been occurred [5]. A new system is evolved for absorption of carbon dioxide using double absorption heat transformation which increases the energy level to a certain limit to reach the required temperature. The aspen plus 11.0 Simulation software is used to stimulate the temperature and flow of CO₂ [6]. The new technologies and the method of implementations are carried out using chemical absorption and scrubbing methods. Alternatively, power-intensive method's like Membrane module for carbon dioxide separation in latest years appears to be an aggressive replacement for standard chemical absorption[7]. In order to reduce the emissions, the project was made by the clean development mechanism (CDM) to control these emissions. According to the Central Electricity Authority (CEA), 2017 report, power generation capacity using various resources has been shown in fig. 9 up to a capacity of 25 MW [8].

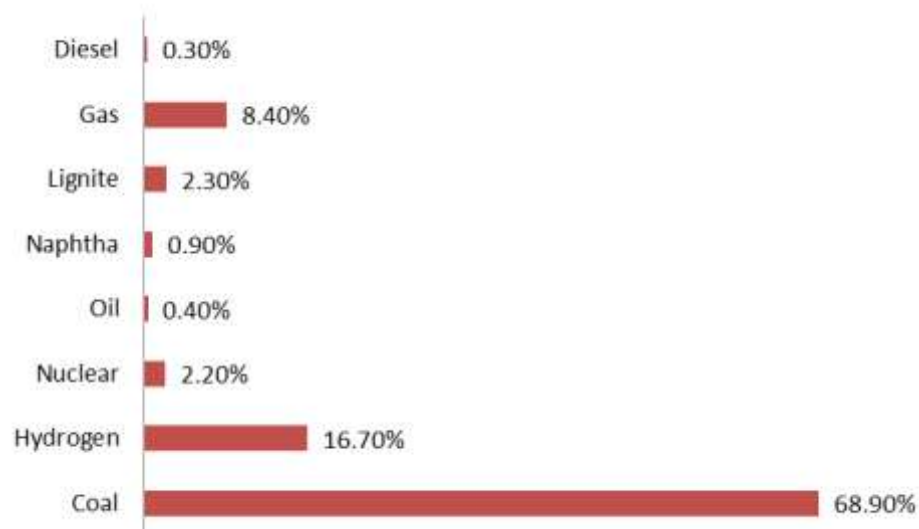


Fig. 9 Power generation capacity using various resources [8]

The optimal solution and important parameters like flow rate and gas rate etc are calculated by the Taguchi method to capture CO₂ from packed bed scrubber [9]. An experimental set-up was proposed for post-combustion CO₂ capture using a hybrid solvent (MEA-Methanol). A comparison with Monoethanolamine (MEA) and MEA-Methanol solvent was compared and concluded that MEA-Methanol hybrid type solvent is better than MEA to capture CO₂ in process industries [10].

3. Conclusion

From the literature survey, it is clear that lot of research work has been done using various solvent as alone to capture CO₂. But, limited work has been observed based on hybrid solvent in the same direction using packed column. So, packed column and the MEA-methanol hybrid solvent can be used to capture CO₂. Also, the system performance can be evaluated with the variation of operating parameters using this hybrid solvent.

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