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Review Article

Research and Studies on Coal Desulphurization

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ABSTRACT

The emission of gases such as sulphur dioxide, nitrogen dioxide etc. is cause of concern from ecological perspectives. These gases can be scrubbed off by using gas absorption and other techniques. Removal of sulphur from fuel can reduce the emission of oxides of sulphur. Coal is one major fuel resource in many sectors. Sulphur can be removed from coal by leaching, bioleaching, precipitation etc. Investigations are reported on various methods for sulphur removal from coal using different methods. Also studies are reported on optimization of the sulphur removal technique by various investigators. Current review summarizes studies and research on sulphur removal from coal.

Key words: leaching, bacteria, removal, desulphurization, time, concentration.

INTRODUCTION

Coal is natural fuel still used in many applications as an important source of energy. The coal contains sulphur, ash and moisture along with carbon. Carbon rich fuel has less emission of oxides of sulphur and nitrogen. These oxides can be removed from flue gases by using methods such as adsorption, biofiltration and chemical conversion. [1-6] The particulate matter can be removed by electrostatic separators, cyclone separators and bag filters. [7-10] The presence of moisture reduces the energy value of coal. The removal of sulphur from coal is essential from energy and environmental perspectives. The present review summarizes research and studies on sulphur removal from coal.

RESEARCH AND STUDIES COAL DESULPHURIZATION

Holda and Mlynarczykowska carried out investigation on biofloatation for desulphurization of fine coal. [11] They discussed the factors affecting biofloatation such as the density of bacterial suspension, the type of bacteria, pH, contact duration, mineral particle size, and the conditions of the microorganism culture, the nature of the bacterial cellular walls, and ash and sulphur content. According to these studies the use of bacteria enables the duration of biological sulphur removal to be reduced from a few weeks, as in the leaching method, to a few minutes.

Cara et.al carried out studies on biodesulfurization for sulphur removal from coal. [12] They tried to improve the operation of a semi-anthracite packed-column leaching. They reduced the sulphate content of the coal to improve the packed column operation. They observed that biological treatment at pH 1.3, increases accessible pyrite surface and hence increases desulphurization. They also found that biological treatment brings down sulphur contain by 24 percent.

Saeid et.al carried out studies on desulphurization of coal and ash removal. [13] They studied effect of high gradient/high strength magnetic fields on a UK coal. They used a high-intensity (HIW) magnetic separator. They achieved total sulphur removal of 10% by using dry magnetic

separation. Froth floatation was used for coal desulphurization by Reza and Farahnaz. [14] According to them desulphurization is an important process. The presence of sulphur in the fuel cause high sulphur oxide emissions. This is one of the causes of acid rains. Also sulphur dioxide has adverse effects on ecology. They carried out experimentation for reduction of sulfur from high sulfur coal of Tabas by froth flotation. They studied effect of various collectors, frothers, pyrite depressants and their consumption dosages on ash and sulfur reduction of Tabas coal. They observed that use of kerosene as collector and pine oil as a frother was best choice among all the materials tested in experiments.

Saydut etc. carried out investigation with aqueous caustic leaching for desulfurization and demineralization of asphaltite. [15] They studied effect of different parameters like alkali concentration, time and temperature on leaching efficiency on desulphurization. They observed that increase in alkali concentration, leaching temperature and prolongation of time favours the process. They achieved 63 percent sulphur removal by using this method. They also observed that increase in alkali concentration increases the sulphur removal. The reason may be the solubilization of many materials at higher alkali concentrations.

Yingzhong et.al carried out studies on desulphurization of high-sulphur coal. [16] They carried out float and sink studies for the feasibility study of the desulphurization of high sulphur coal. According to these studies it was possible to reduce sulphur content below 1.33 percent. By float and sink method, it is easy to find heterogeneity of sulphur. Bragança and Castellan investigated FBC desulfurization process using coal with low sulfur content. [17] They employed a metamorphic limestone and a dolomite as SO_2 sorbents in the desulfurization of gas from coal combustion. They studied the parameters such as bed temperature, sorbent type, and sorbent particle size at different Ca/S molar ratios. Addition of reasonable amount of lime stone helped sulphur control.

CONCLUSION

The use of microorganisms, bacteria enables the duration of biological sulphur removal to be reduced from a few weeks. Biological treatment at pH 1.3, increases accessible pyrite surface and hence increases desulphurization. Biological treatment brings down sulphur contain by 20-25 percent. Froth floatation is also efficient method for sulphur removal from coal. In leaching, increase in alkali concentration increases the sulphur removal. By float and sink method, it is easy to find heterogeneity of sulphur.

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