World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:11, No:08, 2017

Laboratory Scale Experimental Studies on CO_2 Based Underground Coal Gasification in Context of Clean Coal Technology

Authors : Geeta Kumari, Prabu Vairakannu

Abstract : Coal is the largest fossil fuel. In India, around 37 % of coal resources found at a depth of more than 300 meters. In India, more than 70% of electricity production depends on coal. Coal on combustion produces greenhouse and pollutant gases such as CO_2, SO_x, NO_x, and H_2S etc. Underground coal gasification (UCG) technology is an efficient and an economic in-situ clean coal technology, which converts these unmineable coals into valuable calorific gases. The UCG syngas (mainly H_2, CO, CH_4 and some lighter hydrocarbons) which can utilized for the production of electricity and manufacturing of various useful chemical feedstock. It is an inherent clean coal technology as it avoids ash disposal, mining, transportation and storage problems. Gasification of underground coal using steam as a gasifying medium is not an easy process because sending superheated steam to deep underground coal leads to major transportation difficulties and cost effective. Therefore, for reducing this problem, we have used CO_2 as a gasifying medium, which is a major greenhouse gas. This paper focus laboratory scale underground coal gasification experiment on a coal block by using CO_2 as a gasifying medium. In the present experiment, first, we inject oxygen for combustion for 1 hour and when the temperature of the zones reached to more than 1000 ºC, and then we started supplying of CO_2 as a gasifying medium. The gasification experiment was performed at an atmospheric pressure of CO_2, and it was found that the amount of CO produced due to Boudouard reaction ($C+CO_2 \rightarrow 2CO$) is around 35%. The experiment conducted to almost 5 hours. The maximum gas composition observed, 35% CO, 22 % H_2, and 11% CH4 with LHV 248.1 kJ/mol at CO_2/O_2 ratio 0.4 by volume.

Keywords : underground coal gasification, clean coal technology, calorific value, syngas
Conference Title : ICETCR 2017 : International Conference on Energy Technologies and Coal Reserves
Conference Location : New York, United States
Conference Dates : August 07-08, 2017