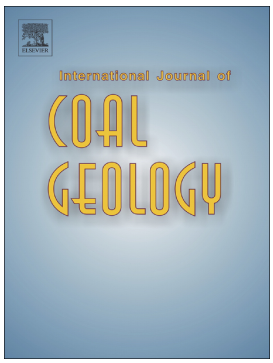

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PII: S0166-5162(18)30147-2
DOI: doi:10.1016/j.coal.2018.05.012
Reference: COGEL 3019

To appear in: *International Journal of Coal Geology*

Received date: 20 February 2018
Revised date: 26 May 2018
Accepted date: 27 May 2018

Please cite this article as: Kan Jin, Yuanping Cheng, Ting Ren, Wei Zhao, Qingyi Tu, Jun Dong, Zhenyang Wang, Biao Hu , Experimental investigation on the formation and transport mechanism of outburst coal-gas flow: Implications for the role of gas desorption in the development stage of outburst. Cogel (2017), doi:10.1016/j.coal.2018.05.012

Experimental investigation on the formation and transport mechanism of outburst coal-gas flow: Implications for the role of gas desorption in the development stage of outburst

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Abstract

As the one of the most catastrophic hazards in underground mining, coal and gas outburst seriously threatens the safe mining of collieries. To understand the formation and transport mechanism of outburst coal-gas flow in roadway as well as evaluate the effects of gas desorption on its development, a new apparatus was developed to conduct simulated experiments with different gases of CO_2 and N_2. Results indicated that the outburst coal-gas flow was a high-speed (up to 41.02m/s during tests) gas-solid two phases flow with extreme complexity, its transport/destructiveness characteristics were significantly influenced by a number of factors including the outburst pressure, coal sample composition, ejection distance and so on. Among these factors, the gas desorption showed the greatest impact when compared to the controlled tests which only considered the effect of free gas expansion. With the effect of gas desorption, especially the rapid gas desorption from powdered coal, the total outburst energy could be promoted by 1.30-2.43 times; the peak values of outburst shockwave could be enhanced by at least 13.67%-63.22%; the transport type of coal-gas flow could be changed from dynamic pressure pneumatic conveying to the static pressure conveying which providing higher capability for outburst coal/rock conveying; the motion of ejected coal flow could have higher speed, longer transport duration and could suffer secondary acceleration. As the result, the destructiveness of outburst coal-gas flow would be remarkably intensified.