

Study on Air Leakage Distribution around Gas Drainage Borehole

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ABSTRACT

Gas drainage is one of the important technical means to control gas disaster in coal mine. Air leakage around boreholes has great influence on gas extraction effects and reduces extraction efficiency. In this paper, Gas drainage mathematical model considering the air leakage of boreholes has been constructed and COMSOL software is used to simulate the coal seam gas drainage process. The distribution and quantity of the air leakage under different borehole sealing length are studied. The results show that with the increase of pumping time, the range of air leakage around the borehole expands gradually, and increase reduces after 30 days of extraction. With the increase of sealing length of the borehole, both the amount and the scope of air leakage around boreholes decreases gradually. The decreasing trend of air leakage area around boreholes is obviously slowed down if the borehole sealing depth is close to the depth of surrounding rock fragmentation zone. The negative pressure of pumping has little influence on the amount and scope of gas leakage in boreholes. Air leakage in boreholes increases a little with the increase of negative pressure of pumping. When negative pressure of pumping increased by 10 kPa, the air leakage increases by only 0.5 L/min. With the increase of suction negative pressure, the area of air leakage near roadway side remains basically unchanged, while the range of air leakage around borehole expands radially and axially. The research result of this paper provides a theoretical basis to develop specific measures to reduce air leakage and improving the effect of gas extraction.

Keywords: Gas drainage, Air leakage, Negative pressure, Drainage borehole, Numerical Simulation