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Study of the technology of heat pipe on prevention wildfire of coal gangue hill

Jun Deng (1,2), Bei Li (1), Ximei Ding (1), Li Ma (1,2)

(1) School of Safety Science and Engineering, Xi'an University of Science and Technology, Xi'an 710054, China, (2) Ministry of Education Key Laboratory of Western Mine Exploration and Hazard Prevention, Xi'an University of Science and Technology, Xi'an 710054, China

Self-ignitable coal gangue hill (CGH) is one kind of special combustion system, which has the characteristics of low self-ignite point, large heat storage, and easy reignition. The currently industrial fire extinguishing methods, such as inhibiting tendency of coal self-ignition, loessial overburden, and cement grouting, had unsatisfied effects for dispersing the heat out in time. Correspondingly, the CGH will lead reignition more frequently with the passage of time. The high underground temperature of CGH threatens the process of ecological and vegetation construction. Therefore, the elimination of high temperature is a vital issue to be solved urgently for habitat restoration. To achieve the ultimately ecological management goal of self-ignitable CGH - extinguishing the fire completely and never reignited, it is crucial to break the heat accumulation. Heat-pipe (HP) has a character of high efficient heat transfer capacity for eliminating the continuously high temperature in CGH. An experimental system was designed to test the heat transfer performance of HP for preventing and extinguishing the spontaneous combustion of coal gangue. Based on the heat transfer theory, the resistance network of the coal-HP heat removal system was analyzed for studying the cooling effect of HP. The experimental results show that the HP can accelerate the heat release in coal gangue pile. The coal temperature could be controlled at 59.6 ˚C with HP in 7 h and the highest cooling value is 39.4 % with HP in 150 h, which can effectively cool the temperatures of high temperature zones. As a powerful heat transfer components, as soon as HPs were inserted into the CGH with a reasonable distance, it can completely play a vital role in inhibiting the coal self-ignition process.