

论文

内铺煤粉方管内瓦斯预混火焰传播特性

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摘要:

为了研究煤粉对方管内瓦斯预混火焰传播过程的影响, 选用典型煤粉试样将其均匀铺于截面100 mm×100 mm、长1.5 m的有机玻璃方管底部, 采用高速摄像机/光电传感器、微细热电偶、压力传感器等测试得到了管内瓦斯火焰传播过程中火焰传播速度、火焰瞬态温度、燃烧压力等参数, 并初步分析了煤粉影响瓦斯火焰传播的机制。结果表明: 有煤粉时火焰传播速度有所增加, 但燃烧反应持续时间明显增长; 内铺煤粉时管内火焰温度的半峰宽度增加, 测点处瞬态温度曲线呈现出较为明显的“双峰”结构, 说明活性的煤粉与瓦斯火焰形成瓦斯-煤粉复合火焰; 有无煤粉时燃烧压力峰值差别不大, 但有煤粉时压力波脉冲宽度增加。

关键词: 煤粉; 瓦斯; 预混火焰; 传播特性; 方管; “双峰”结构

Flame propagation characteristics for premixed methane air with coal dust in square tube

Abstract:

In order to study the influence of coal dust on premixed methane air flame propagation in tube, the typical coal dust was well distributed at the bottom of square plexiglass tube with its section 100 mm×100 mm and 1.5 meters long. The high speed video camera/photoelectric sensors, subtle thermocouples and pressure sensors were adopted to obtain the premixed methane air flame parameters including flame propagating velocity, flame transient temperature and deflagration pressure along the tube, respectively. And the mechanisms of the coal dust influencing flame propagation were preliminarily analyzed. The experimental results show that coal dust can accelerate the methane air flame propagation in tube, and the flame propagating velocity is increased, but the combustion duration is also increased; the half peak width of the temperature is broadened under the condition of coal dust in tube, and the transient temperature values of methane air premixed flame at testing points obviously presents the wave of “twin peaks structure”, which suggests that the reactive coal dust and the methane forms the methane/coal dust composite flame; there is no obvious difference for the combustion peak pressure with or without coal dust, but the pressure pulse width is broadened in coal dust condition.

Keywords: coal dust; methane; premixed flame; propagation characteristic; square tube; twin peaks structure

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