煤炭学报 2013, 38(S2) 383-387 DOI: ISSN: 0253-9993 CN: 11-2190

论文

瓦斯爆燃火焰在狭缝中的动态传播及淬熄特性

温小萍，余明高，解茂昭，刘志超

1.河南理工大学 机械与动力工程学院，河南 焦作 454003；
2.大连理工大学 能源与动力学院，辽宁 大连 116024

摘要：

为研究狭缝对瓦斯爆燃火焰的阻燃机理，在单步不可逆化学反应和EBU-Arrhenius燃烧模型基础上，对不同火焰初始速度和狭缝间距的瓦斯爆燃火焰动态传播规律及淬熄特性进行数值模拟。数值结果表明，在火焰初始速度小于167 m/s且狭缝间距小于1.2 mm条件下，瓦斯爆燃火焰在狭缝中均有可能发生淬熄。淬熄距离与火焰初始速度及狭缝间距有关，即初始火焰速度或狭缝间距越小，淬熄距离将随之减小，火焰越容易被阻燃。实验验证表明，数值模拟结果与实验数据吻合较好，但是当火焰初始速度增大时计算误差随之增大，其原因是由于湍流强度增大使淬熄温度发生变化。

关键词： 瓦斯；爆燃火焰；狭缝；动态传播；淬熄

Dynamic propagation and quenching characteristics of gas deflagrating flame in narrow channel

Abstract:

To obtain the fire retardant mechanism of gas deflagration flame in narrow channel，a numerical simulation on the dynamic propagation and quenching characteristics of gas deflagration flame with different initial flame velocities and channel gaps was conducted based on a single-step irreversible chemical reaction and EBU-Arrhenius combustion model.The simulation results indicate that the gas deflagration flame might be quenched under certain conditions that the initial flame velocity is less than 167 m/s and channel gap is less than 1.2 mm.The initial flame velocity and channel gap directly affect the quenching distance.The smaller the flame velocity or channel gap，the shorter the quenching distance，meaning that the gas deflagration flame would be easier to be quenched.Compared with the experimental data in previous literatures under the same conditions，the simulation data are in good agreement with the experiment results，but the calculation error increases with the increase of the initial flame velocity because the quenching temperature changes as a result of increasing turblence intensity.

Keywords: gas；deflagrating flame；narrow channel；dynamic propagation；quenching

收稿日期 2012-11-13 修回日期 2013-02-06 网络版发布日期 2013-09-17

DOI:

基金项目:

国家自然科学基金资助项目（50974055，51176021）

通讯作者: 温小萍