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论文

煤矿巷道内N2及CO2抑制瓦斯爆炸的机理特性

贾宝山，温海燕，梁运涛，王小云

辽宁工程技术大学研究生学院

摘要：

为探求煤矿巷道内惰性气体（氮气及二氧化碳）对瓦斯预混合爆炸的影响，采用详细反应机理(包括53种组分、325个反应)，运用化学动力学计算软件CHEMKIN 3.7中PREMIX程序包，建立巷道内瓦斯爆炸过程的数学模型。通过数值计算，对比了N2及CO2对瓦斯爆炸过程中反应物、自由基、爆炸后产生的主要致灾性气体的浓度以及甲烷总消耗速率等变化的影响，分析N2及CO2对瓦斯爆炸反应过程影响的异同。计算结果表明，在相同体积分数下，CO2比N 2更能有效地降低体系中的活化中心浓度和爆炸中所生成致灾性气体CO，NO的浓度，因此CO2在抑制瓦斯爆炸作用方面比N2的效果更为明显。

关键词： 煤矿巷道；瓦斯爆炸；机理特性；数值计算

Mechanism characteristics of CO2 and N2 inhibiting methane explosions in coal mine roadways

Abstract:

In order to determine the effect of inert gas (N2 and CO2) on the process of methane premixed explosion in coal mine roadways, the detailed reaction mechanisms (include 53 mixtures, and 325 reactions) were investigated in this study.The mathematical model of methane explosion in the coal mine roadway was developed using the PREMIX code of CHEMKIN 3.7 chemical kinetics packages.Through numerical computation, the change currents of reactant and free radical concentration, catastrophic gases generated from methane explosion and total consumption rate of methane were compared, due to the effect of N2 and CO2 on methane explosions, and the similarities and differences were also analyzed.The results show that CO2 is more effective than N2 in lowering the concentration of activation center during the reaction system and main catastrophic gases of CO and NO resulting from methane explosion.Therefore, it concludes that ：CO2 is more effective than N2 in inhibiting methane explosion.

Keywords: coal mine roadway; methane explosion; mechanism characteristics; numerical computation

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通讯作者: 贾宝山

作者简介: 贾宝山（1972—），男，河北阜平人，教授，博士生导师，博士

作者Email: jbs1972@126.com

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