

催化、动力学与反应器

过渡金属氧化物对烟火药剂的催化作用

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摘要

为了提高含高氯酸钾和硝酸钾烟火药剂的反应速率,应用混合法和结晶法将过渡金属氧化物(TMO)氧化铁添加到含高氯酸钾的烟火药剂中,将氧化铜添加到含硝酸钾的烟火药剂中。利用绝热加速量热仪(ARC)分别研究了氧化铁对含高氯酸钾烟火药剂、氧化铜对含硝酸钾烟火药剂的催化作用。结果表明,氧化铁对含高氯酸钾的烟火药剂具有催化作用,以结晶添加法催化效果最佳;此药剂的最大反应速率为 8.10 min^{-1} ,是不含催化剂药剂的4.09倍;到达最大反应速率时间为8.52 min,比不含催化剂的药剂降低了92.8%。氧化铜对含硝酸钾的烟火药剂具有催化作用,混合法添加的催化效果最佳;此药剂最大反应速率为 7.38 min^{-1} ,是不含催化剂药剂的1.30倍;到达最大反应速率时间为53.55 min,比不含催化剂的药剂降低了66.3%。

关键词

[过渡金属氧化物](#) [高氯酸钾](#) [硝酸钾](#) [烟火药剂](#) [催化](#)

分类号

Catalysis of transition metal oxides for pyrotechnical reagent

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Abstract

In order to improve the reaction rate of pyrotechnical reagent, transition metal oxides (TMO), Fe_2O_3 and CuO , were added into potassium perchlorate and potassium nitrate respectively by mixing and crystallization methods. Accelerating rate calorimeter (ARC) was used to study the catalytic behavior of TMO. Results illustrated that Fe_2O_3 can catalyze pyrotechnical reagent with potassium perchlorate, and the addition is better with crystallization method. The maximal reaction rate of pyrotechnical reagent with potassium perchlorate added with Fe_2O_3 by crystallization method is 8.10 min^{-1} , which is 4.09 times of that without catalyst. The time to maximal rate is 8.52 min, which is lower than that without catalyst by 92.8%. It was also found that CuO can catalyze pyrotechnical reagent with potassium nitrate, and the addition is better with mixing method. The maximal reaction rate of pyrotechnical reagent with potassium nitrate added with CuO by mixing method is 7.38 min^{-1} , which is 1.30 times of that without catalyst. The time to maximal rate is 53.55 min, which is lower than that without catalyst by 66.3%.

Key words

[transition metal oxides](#) [potassium perchlorate](#) [potassium nitrate](#) [pyrotechnical reagent](#) [catalysis](#)

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