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Preparation of Nano-sized β -Cu and Its Catalytic Effects on Ammonium Perchlorate

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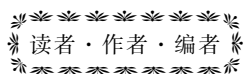
Abstract: Nano β -Cu(copper β -resorcyate) were prepared via a facile wet mechanical grinding method, and were characterized by powder X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM) and transmission electron microscopy (TEM). Meanwhile, the catalytic properties of nano β -Cu were investigated. Results reveal that the nano β -Cu is semi-spherical and homogeneous with a fairly uniform size of 100 nm. DSC results show that the nano β -Cu has significant catalytic effects on ultra-fine AP with different particle size. The peak temperature of decomposition in the high temperature range for 6 μ m and 1 μ m AP decreases to 373.1 $^{\circ}$ C and 351.2 $^{\circ}$ C, respectively, and the apparent decomposition heat increases to 1529 J \cdot g⁻¹ and 1513 J \cdot g⁻¹, respectively. And the reaction rate constant increases about 10 times. Compared with 6 μ m AP, nano β -Cu makes the peak temperature of the high temperature decomposition of 1 μ m AP obviously lower, and the reaction rate constant much higher, indicating nano β -Cu exhibits much better catalytic efficiency for accelerating the thermal decomposition of 1 μ m AP.

Key words: copper β -resorcyate(nano β -Cu); ammonium perchlorate(AP); thermal decomposition; catalysis

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高品质炸药晶体的出现为钝感弹药的研究与应用开辟了一条重要途径,高品质炸药晶体因而也成为目前国内外含能材料研究领域的热点之一。为促进高品质炸药晶体的研究和应用,《含能材料》将于2015年开设高品质炸药晶体研究专栏,专题报道高品质炸药晶体的制备、表征、性能、应用等领域的最新研究成果,促进学者间的交流。欢迎相关研究学者投稿。来稿建议为英文。来稿时请选择对应的专栏。

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