

Thermal Sensitivity of Energetic Materials Characterized by Accelerating Rate Calorimeter (ARC)

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Abstract: Traditional test methods for thermal sensitivity of solid energetic materials were summarized. Aiming at the limitation of the fact that these methods cannot be applied to liquid energetic materials, a method using Accelerating Rate Calorimeter (ARC) to test thermal sensitivity of energetic materials was put forward. The decompositions of four solid explosives Pentaerythritol tetranitrate (PETN), Hexogen (RDX), Octogen (HMX), 2,4,6-Trinitrotoluene (TNT) and two liquid energetic materials Nitroethane (NE), 2-Ethylhexyl nitrate (EHN) were studied by ARC. Kinetic and thermodynamics parameters were calculated and analyzed. Temperature corresponding different time to maximum rate under adiabatic condition (θ) was calculated. Thermal sensitivity of four solid energetic materials is PETN > RDX > HMX > TNT, which is consistent with the conclusion obtained by the traditional Wood's alloy bath method, therefore ARC can be employed to the test of the thermal sensitivity of both solid and liquid energetic material. The thermal sensitivity order of six energetic materials from high to low is EHN > PETN > RDX > HMX > TNT > NE.

Key words: physical chemistry; safety engineering; thermal sensitivity; energetic materials; accelerating rate calorimeter (ARC); time to maximum rate under adiabatic condition; bursting point

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2011年10月28~31日,中国兵工学会2011年学术年会如期在苏州工业园区的国际博览中心举行,本次学术年会的主题是“武器装备研制、保障前沿理论与关键技术”。

学术年会进行了8个大会报告和30个分会报告。大会报告中,紧扣“研制和保障”主题,装甲兵工程学院的臧克茂院士介绍了新型坦克/装甲车辆的全电化技术及其发展思路;中国兵器工业第202所的崔万善研究员结合对空袭与反空袭非对称作战条件的分析,对我国末端防御技术发展思路进行了思考;清华的王建民教授介绍了一种先进的装备保障服务思想。分会报告中,装甲兵工程学院的杨宏伟教授介绍了现代武器装备的“三维度”设计理念,总装工程兵一所的蒋晓军介绍了陆军武器装备数码迷彩技术应用与发展。学术年会论文集共收录论文209篇,涉及含能材料相关研究的包括:1、探索新能源的军用工程机械,包括新能源的动力电池、混合动力、贮氢材料等作能源的机械;2、金属结构材料及非金属材料,包括铝合金、高强度钢、高密度钨合金、钛合金、碳纤维、陶瓷等,为装备轻量化做准备;3、自适应伪装材料,针对可见、红外及雷达波段的自适应伪装的各类隐身材料;4、高效毁伤战斗部,重点包括低易损炸药及先进装药技术、低感度装药及装药技术、爆轰能量可调技术、高爆速炸药及装药技术,新型杀伤元应用技术、引信一体化技术、抗高过载引信和火工品技术等。会场外布满了展位,来自总装备部有关科研院所、兵器工业集团各研究所、北京理工大学、南京理工大学、中标软件有限公司、中国电波传播研究所等20余家单位参加了展览,展示了装备研制及保障领域军民融合方面的新技术和新产品。

此次年会为各行科技人员搭建一个很好的平台,让技术得到充分交流,共同促进军用技术的发展。

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