[4] Pourmortazavi S M, Hajimirsadeghi S S, Kohsari I, et al. Thermal decomposition of pyrotechnic mixtures containing either aluminum or magnesium powder as fuel[J]. *Fuel*, 2008, 87: 244 -251.

[5] 聂芝侠,李葆萱,胡松启,等. 镁铝富燃料推进剂燃烧性能研究[J]. 固体火箭技术,2008,31(3): 243 -246.
NIE Zhi-xia, LI Bao-xuan, HU Song-qi, et al. Study on combustion performance of magnesium-aluminum fuel-rich propellants [J]. *Journal of Solid Rocket Technology*, 2008, 31(3): 243 -246.

[6] 陈明华,焦清介,刘礼斌. 镁/聚四氟乙烯红外诱饵剂燃烧速度的计算[J]. 火工品,2004,3: 5 -8.
CHEN Ming-hua, JIAO Qing-jie, LIU Li-bin. The calculation on burning rate of Mg/PTFE infrared composition[J]. *Initiators and Pyrotechnics*, 2004, 3: 5 -8.

[7] 杨毅,王进,宋洪昌,等. 超细硼粉粒径对 B/AP 复合物热性能影响[J]. 宇航学报,2007,28(6): 1724 -1727.
YANG Yi, WANG Jin, SONG Hong-chang, et al. Effect of superfine boron diameter on the thermal properties of B/AP composite [J]. *Journal of Astronautics*, 2007, 28(6): 1724 -1727.

[8] 蒋黎,曾雁,张力,等. 纳米材料在火炸药中的应用研究现状[J]. 河北化工,2007,30(2): 21 -23.
JIANG Li, ZENG Yan, ZHANG Li, et al. Application of nanophase materials in explosives[J]. *Hebei Chemical Engineering and Industry*, 2007, 30(2): 21 -23.

[9] 李颖,宋武林,谢长生,等. 纳米铝粉在固体推进剂中的应用进展[J]. 兵工学报,2005,26(1): 121 -125.
LI Ying, SONG Wu-lin, XIE Chang-sheng, et al. Progress in the application of nano aluminum powder in solid propellants[J]. *Journal of China Ordnance*, 2005, 26(1): 121 -125.

[10] 吴婉娥,毛根旺,鲁军,等. 镁铝金属粉对含硼富燃料推进剂燃烧性能及硼氧化效率的影响研究[J]. 含能材料,2008,16(4): 458 -461.
Effect of Mg and Al powders on combustion performance of boron-based fuel-rich propellant and oxidation efficiency of boron[J]. *Chinese Journal of Energetic Materials (Hanneng Cailiao)*, 2008, 16(4): 458 -461.

[11] 李凤生,杨毅. 纳米 P 微米复合技术及应用[M]. 北京: 国防工业出版社,2002: 111 -113.
LI Feng-sheng, YANG Yi. Application and Preparation of Nanometer and Micrometer Composite [M]. Beijing: National Defense Industry Press, 2002: 111 -113.

Effect of Magnesium Powder Particle Size on Combustion Properties of Mg/PTFE Fuel-rich Propellant

ZHENG Lei, PAN Gong-pei, CHEN Xin, QIAO Li

(*School of Chemical Engineering, Nanjing University of Science and Technology, Nanjing* 210094, *China*)

Abstract: The effect of magnesium powder particle size on the combustion properties of Mg/PTFE fuel-rich propellant was studied. The thermal properties of Mg/PTFE were studied by using differential thermal analysis (DTA) and thermogravimetry (TG). The linear and molar burning rate were measured by high speed photography, and the flame temperature was surveyed by infrared radiation thermometers. The results show that reducing magnesium powder's size had little weight on thermal analysis but steps up burning velocity even more than three times. The flame temperature of pyrotechnic fuel rich propellant heighten about 170 ℃ along with the diameter of magnesium powder decrease.

Key words: military chemistry and pyrotechnics; fuel rich propellant; combustion performance; PTFE

CLC number: TJ55; V512 **Document code**: A **DOI**: 10.3969/j.issn.1006-9941.2010.02.012

读者·作者·编者

香港城市大学张开黎博士在四川绵阳进行学术交流

2010 年 4 月 6 日至 8 日,香港城市大学张开黎博士在四川绵阳中国工程物理研究院化工材料研究所进行为期 3 天的学术交流。张开黎博士在纳米含能材料、微推进器和微起爆器方面有多年研究经验,与法国国家科研中心 LAAS 国家实验室的 Carole Rossi 一起提出了 nanoenergetics-on-a-chip (NOC)技术。学术交流围绕纳米含能材料在空间卫星调姿、纳米含能材料集成化、器件化等主题进行,结合近年先进材料的研究进展,大家对含能材料的发展趋势进行了充分讨论,认为纳米含能材料作为微型智能化起爆装置具有重要的意义,潜力巨大,是纳米含能材料工程化应用的一个极具潜力的方向。

(中国工程物理研究院化工材料研究所 杨光成供稿)