

- HOU Jun-cai, LI Chao, JIA Wei-dong, et al. Effect of negative DC electric field on premixed methane/air flame at different initial pressures[J]. *CIESC Journal*, 2018, 69(4): 1602-1610.
- [28] Farre-Rius F, Guiochon G, Chem A. Conditions of flash pyrolysis of polymers as used in pyrolysis-gas chromatography[J]. *Analytical Chemistry*, 1968, 40(6): 998-1000.
- [29] Kashiwagi T, Hirata T, Brown J E. Thermal and oxidative degradation of poly(methyl methacrylate) molecular weight[J]. *Macromolecules*, 1985, 18(2): 1410-1418.
- [30] Wilde J P. Fuel pyrolysis effect on hybrid rocket and solid fuel ramjet combustor performance[D]. Delft: Delft University of Technology, 1991.

Effect of High Voltage Electric Fields on the Combustion Characteristics of PMMA

YANG Xiao-long¹, WEI Zhi-jun¹, ZHANG Ze-lin¹, ZHANG Jing-jia¹, WANG Jia-xing²

(1. School of Aerospace Engineering, Beijing Institute of Technology, Beijing 100081, China; 2. Shanghai Space Propulsion Technology Research Institute, Shanghai 201109, China)

Abstract: Due to great demands on solid rocket motor and solid ramjet for thrust control, the experimental study on the effect of high voltage electric fields on the combustion characteristics of solid fuel polymethyl methacrylate (PMMA) was carried out. The effect of electric fields on the flame structure of PMMA, as well as its burn rate, temperature and flame flow-field was analyzed. The results show that the deformation of PMMA flame is significant under the negative electric fields. When larger electric fields are imposed, their effects on the flame become more significant. The high-voltage electric fields can greatly change the burn rate of PMMA. The burn rate of PMMA increases with the applied positive voltage amplitude by about 34.2%. Under the negative electric fields, the burn rate of PMMA decreases firstly with the increase of the voltage amplitude, and then increases. The burn rate can be decreased by about 15.7%, and it can also be increased by about 15.4%. The maximum temperature of PMMA is decreased when it is subject to the electric fields. The PMMA flame flow increases with the amplitude increase of the voltage. The interaction of buoyancy and electric volume force may be the factors that lead to the change of flame shape, temperature and the thermal feedback of the flame to the solid phase.

Key words: thrust control; high voltage electric field; solid fuel; electronically controlled combustion; flame structure; polymethyl methacrylate (PMMA)

CLC number: TJ55

Document code: A

DOI: 10.11943/CJEM2018347

(责编:张琪)



深切缅怀含能材料热分析专家——胡荣祖先生

《含能材料》特邀顾问,含能材料热化学热分析专家胡荣祖先生2019年4月1日因病于西安辞世,享年81岁。《含能材料》编辑部为失去这样一位德高望重的老前辈、老朋友而深表哀痛!

胡荣祖先生1938年6月1日出生于江苏无锡,毕业于浙江大学工程力学系,随后进入西安近代化学研究所从事材料热化学热分析研究。曾任“国际热分析与量热学协会”理事(1998-2000),《J. Therm. Anal. Cal.》中国区编委(1993-2000),中国化学会化学热力学与热分析专业委员会委员、副主任委员(1994-2002),陕西省学位委员会学科评议组成员,西北大学化学系、曲阜师范大学化学系、中国工程物理研究院化工材料研究所等高校和研究所兼职教授,主持和参加了多项基金项目,发表研究论文420余篇,是我国该研究领域的著名专家和学者,为含能材料热化学、热分析研究做出了积极贡献。

胡荣祖先生是《含能材料》的创刊人董海山院士的学术挚友,他们曾合著《含能材料热谱集》一书。在《含能材料》创刊之初,胡荣祖先生就应董院士之邀担任编委,此后二十多年间,胡荣祖先生为刊物发展倾注了大量心血。他为创刊号撰文《3-硝基-1,2,4-三唑-5-酮(NTO)根锰(II)盐[Mn(H₂O)₆](NTO)₂·2H₂O的制备和晶体结构》,并先后在《含能材料》署名发文50余篇。他长期以来为期刊审校英文,即便在古稀之年也保持着严谨、缜密的治学态度。胡荣祖先生为提升《含能材料》的学术质量和国际化发展做出了重要贡献。

胡荣祖先生深厚的学术功底和勤勉务实的学术作风一直影响着《含能材料》编辑部的全体同仁。在创刊20周年之际,胡荣祖先生曾为期刊题词“传承学术,再铸辉煌”,他的鼓励与期望激励着《含能材料》不断进步!

胡荣祖先生的赤诚之心和大家风范将永远铭刻在我们心中。

