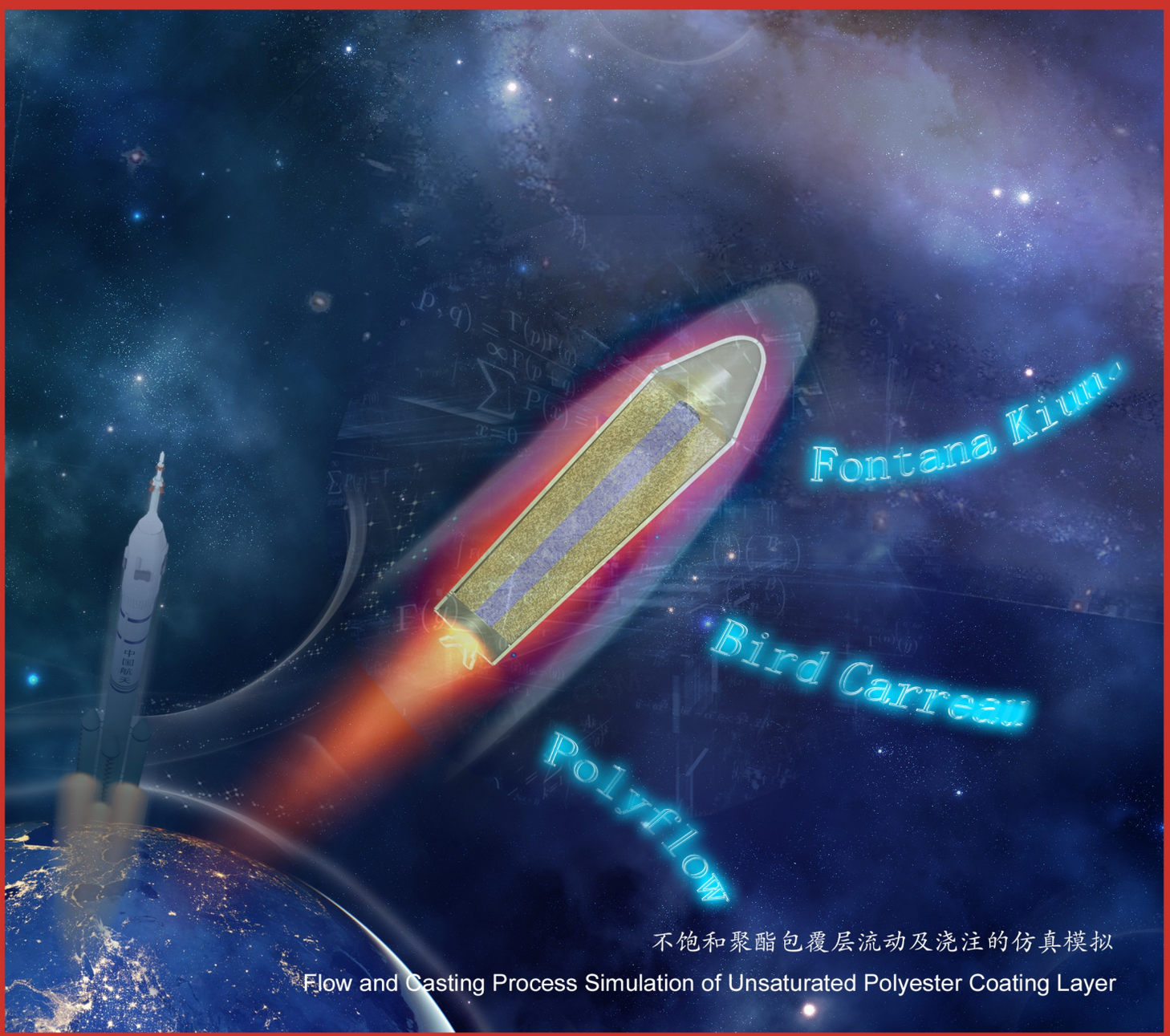
中文核心期刊
中国科技核心期刊
RCCSE中国核心学术期刊
中国科学引文数据库来源期刊
EI、SCOPUS、CA、CSA、AJ、JST收录期刊

ISSN 1006-9941
CN 51-1489/TK
CODEN HACAFQ

含能材料

CHINESE JOURNAL OF ENERGETIC MATERIALS



不饱和聚酯包覆层流动及浇注的仿真模拟

Flow and Casting Process Simulation of Unsaturated Polyester Coating Layer

HANNENG CAILIAO

2022 第30卷 11

2022年 第 30 卷 第 11 期
（总第205期）

目　次

11月25日出版
（月刊）

1081　含能快递

推进与发射

1083　B-GAP基推进剂药浆流变特性和固化动力学研究
卢鑫浩，叶宝云，程王健，安崇伟，王晶禹，赵凤起，秦　钊

1090　基于DIC技术的固体火箭发动机装药粘接界面参数反演研究
肖云东，王玉峰，李高春，孔令泽，伍　鹏，赖帅光

1099　制式包装设计压力对无水肼液体推进剂危险等级分类影响试验
徐飞扬，姚亚东，吴星亮，王　旭，李文海，陈世雄，刘大斌，徐　森

1106　不饱和聚酯包覆层流动及浇注的仿真模拟
张豫鲁，刘奔奔，陈国辉，曹贝贝，何吉宇，李向梅，杨荣杰

1118　吸收系数对激光烧蚀二硝酰胺铵推进性能影响
孔红杰，叶继飞，毛晨涛，杜宝盛，郑永赞，崔海超

制备与性能

1125　高纯2,4,6-三硝基-5-乙氧基-1,3-苯二胺的合成及性能
乔　琛，梁　义，吴金婷，谌思嘉，赵廷兴，张　勇，黄　明，李鸿波

1132　三维石墨烯粉体制备及其红外消光性能
李慧莹，王玄玉，刘志龙，孙淑宝，魏庆连

1138　炭载体制备条件对$Pd(OH)_2$/C催化剂氢解脱苄性能的影响
南俊平，王瑜凌，宋建伟，卫改霞，陈　云，丁鑫磊，戴恒玮，白广梅，邱文革

1147　BPTAP的荧光特性及其稳定性
楼英杰，陈建波，丁　欢，刘　渝，王　涛

综述

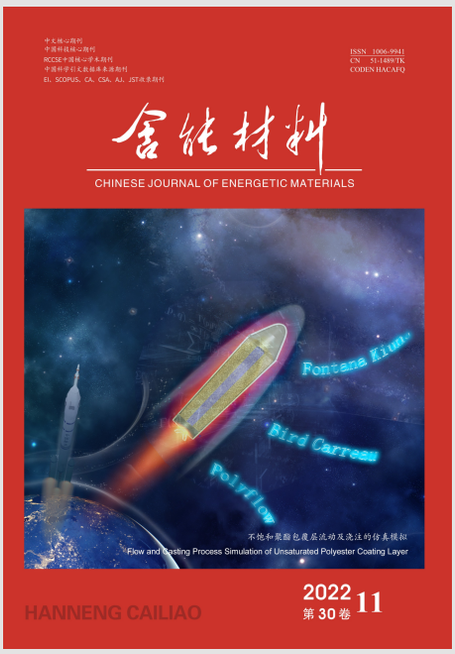
1155　硼氢类自燃离子液体的研究进展
符立言，焦冰晶，王棒棒，崔尚平，蒿银伟

1167　高能碳氢燃料绿色合成技术研究进展
余　锐，刘显龙，史成香，潘　伦，张香文，邹吉军

1177　亚氨基桥联的富氮杂环化合物研究进展
周治宇，廖思丞，刘天林，张庆华

◎ COVER STORY | 封面故事　P1106

不饱和聚酯包覆层流动及浇注的仿真模拟



不饱和聚酯(UPR)因其良好的力学性能、优异的加工性能和抗迁移性，在固体火箭推进剂的药柱包覆应用中备受青睐。目前，对UPR包覆的研究主要集中于UPR包覆层的性能与应用，对其包覆工艺的研究则相对较少，实际浇注包覆过程中涉及到许多复杂的工艺参数的选择，耗时且耗材。因此，对浇注过程进行模拟仿真，可以大大减少重复试验的次数，优化包覆工艺的同时，提高包覆效率和质量。来自北京理工大学李向梅等研究人员通过分析UPR包覆层的流动性和浇注条件，在Fontana-Kiuna模型基础上引入指数函数，得到匹配的化学流变模型，并在此基础上建立了UPR固化时粘度与时间、温度的函数关系，得到了适合包覆层浇注操作的温度；随之以Bird-Carreau幂律方程建立UPR流体的本构方程，并使用Polyflow软件在前述温度下对不同模式下UPR包覆层的浇注过程进行了模拟。结果表明，为了保证UPR包覆层浇注的完整度，浇注温度需在35 ℃以下，浇注压力应大于1 MPa，且入口流速应界于150 $mm^3 \cdot s^{-1}$与175 $mm^3 \cdot s^{-1}$之间。

模拟仿真不饱和聚酯(UPR)包覆工艺

封面以星空为背景，矗立的火箭与浩瀚的星空交映成辉，简洁直观地交待了本研究的火箭推进剂研究背景。封面居中放大部分为研究主体—固体火箭推进剂的不饱和聚酯(UPR)包覆层，图示中公式暗示文章的研究方法主要为模拟仿真，Fontana-Kiuna模型，Bird-Carreau幂律方程及Polyflow软件等突出显示了理论模拟对UPR包覆层研究的指导作用。

◎ 封面效果 / @山鹰·翼简设计
◎ 责任编辑 / 王馨逸　姜梅　高毅
◎ 期刊基本参数 CN 51-1489/TK * 1993 * m * A4 * 106 * zh+en * P * ￥20.00 * 700 * 12 * 2022-11

2022 Volume 30, Issue 11 (Sum No. 205)
25 November, 2022 (Monthly)

CONTENTS

含能材料
Chinese Journal of Energetic Materials

Energetic Express

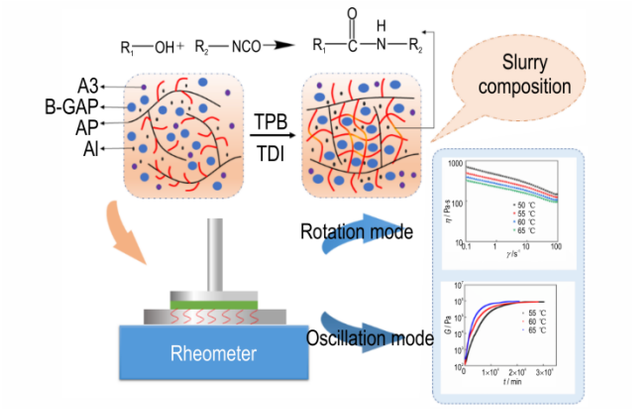
P1081

Propulsion and Projection

Research on Rheological Properties and Curing Kinetics of B-GAP-based Propellant Slurry

LU Xin-hao, YE Bao-yun, CHENG Wang-jian, AN Chong-wei, WANG Jing-yu, ZHAO Feng-qi, QIN Zhao

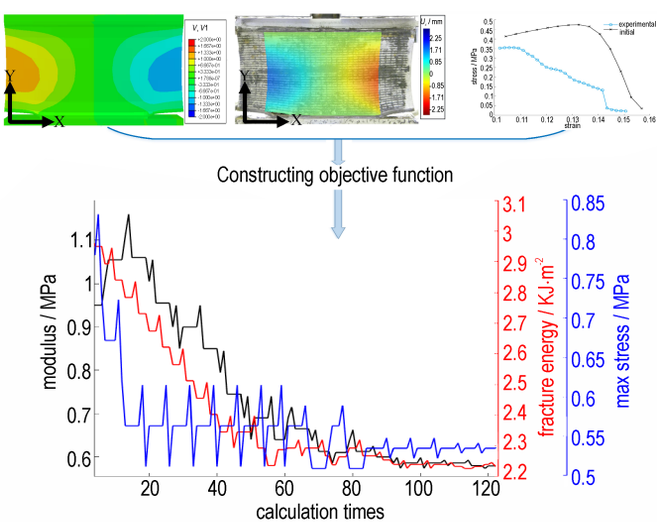
P1083 The viscosity and modulus of B-GAP/TDI propellant slurry were tested by rheological method, and the curing kinetic model was established.



Parameters Inversion of Adhesive Interface of Solid Rocket Motor Based on DIC Method

XIAO Yun-dong, WANG Yu-feng, LI Gao-chun, KONG Ling-ze, WU Peng, LAI Shuai-guang

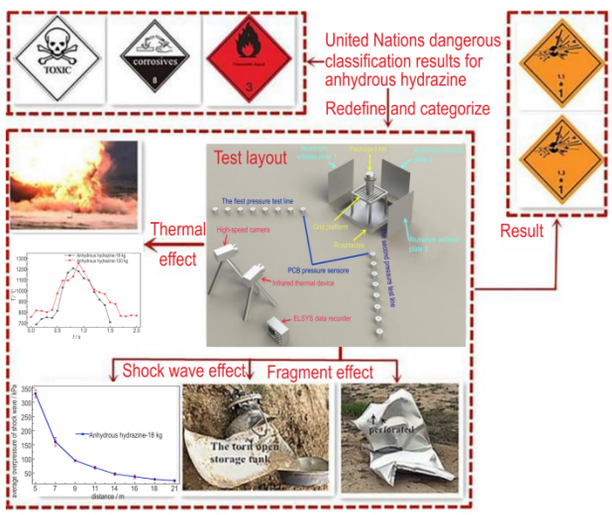
P1090 The inversion identification method combined with digital image correlation method and Hooke-Jeeves optimization algorithm is used to carry out the relevant parameters of bilinear cohesive zone model used for the adhesive interface. The question about the relevant parameters of cohesive zone model can not be carried out by traditional empirical method accurately is solved effectively through the used inversion method. The limitation of the common inversion method of constructing objective function by load-displacement data is improved.



Experimental Study on the Influence of Standard Packaging Design Pressure on the Hazard Classification of Anhydrous Hydrazine Liquid Propellant

XU Fei-yang, YAO Ya-dong, WU Xing-liang, WANG Xu, LI Wen-hai, CHENG Shi-xiong, LIU Da-bin, XU Sen

P1099 Anhydrous hydrazine was assigned to Class 8 (corrosivity) and the subsidiary hazard classes of which were inflammability (Class 3) and toxicity (Division 6.1). However, as one of the typical energetic materials, anhydrous hydrazine should follow the explosive hazard classification procedure and hence be classified in Class 1. In this context, to improve the hazard classification of packaged anhydrous hydrazine, the hazard classification of packaged anhydrous hydrazine (18 kg and 120 kg) was investigated by means of extremely insensitive detonating substance (EIDS) gap test and external fire test.



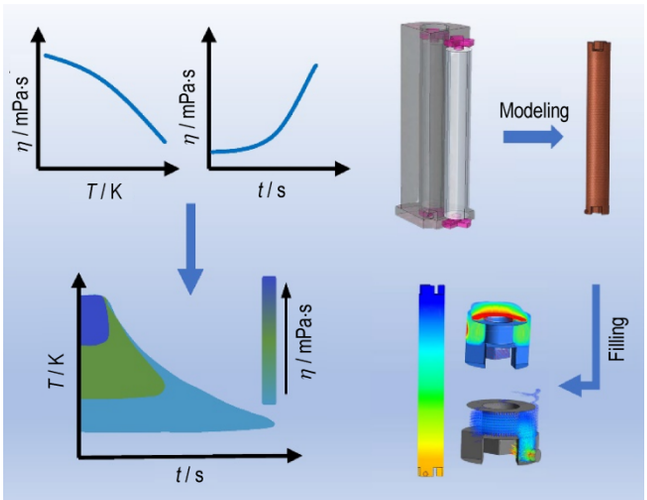
CONTENTS

含能材料
Chinese Journal of Energetic Materials

Flow and Casting Process Simulation of Unsaturated Polyester Coating Layer

ZHANG Yu-lu, LIU Ben-ben, CHEN Guo-hui, CAO Bei-bei, HE Ji-yu, LI Xiang-mei, YANG Rong-jie

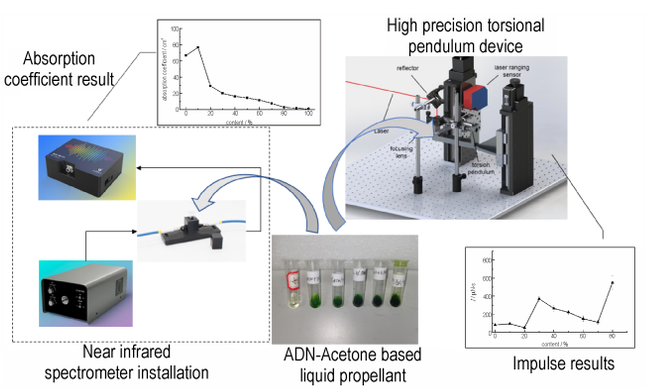
P1106 In this study, the rheological of unsaturated polyester (UPR) cladding was analyzed. The matching chemical rheological model was obtained through the improved Fontana-Kiuna model, and the temperature suitable for the cladding filling operation was obtained. Through the establishment of mold model and fluid flow model, the whole process of cladding filling was simulated, the influence of filling rate and filling pressure on cladding molding integrity was analyzed, and the possible location of defects was predicted.



Effect of Absorption Coefficient on Propulsion Performance of Laser-ablated Ammonium Dinitramide

KONG Hong-jie, YE Ji-fei, MAO Chen-tao, DU Bao-sheng, ZHENG Yong-zan, CUI Hai-chao

P1118 For laser propulsion, there are few existing studies on liquid energetic materials. In this work, the effect of absorption coefficient on laser propulsion performance of ammonium dinitramide (ADN) liquid is studied. ADN and absorbent were mixed with different proportions to form ADN-acetone-based liquid propellant. The absorption coefficient of propellant was measured using a near infrared spectrometer installation. The micro impulse generated by laser-ablated propellant was measured using a high-precision torsion pendulum device. The experimental results can provide reference for future research on the laser ablation of liquid propellants.

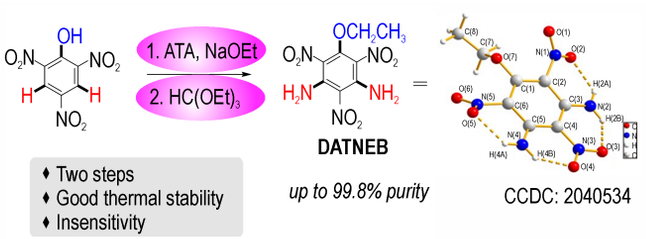


Preparation and Property

Synthesis and Properties of High Purity 2, 4, 6-Trinitro-5-ethoxy-1, 3-phenylenediamine

QIAO Chen, LIANG Yi, WU Jin-ting, SHEN Si-jia, ZHAO Ting-xing, ZHANG Yong, HUANG Ming, LI Hong-bo

P1125 DATNEB with high purity (>99.8%) was synthesized from picric acid in two steps, namely amination and ethylation steps, the total yield was 32.5%. The single crystal was grown by the slow solvent evaporation method, and the structure of the single crystal was analyzed by X-ray single crystal diffraction. The thermal and detonation property were determined by TG-DSC and DFT calculations.



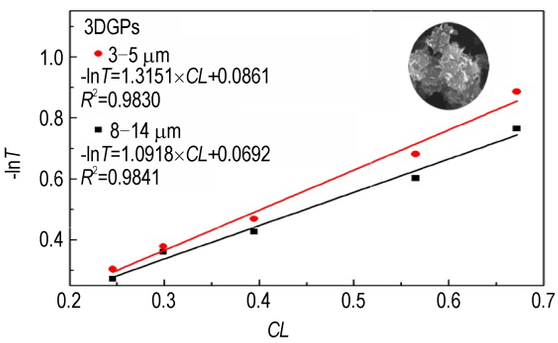
2022 Volume 30, Issue 11 (Sum No. 205)
25 November, 2022 (Monthly)

CONTENTS

含能材料
Chinese Journal of Energetic Materials

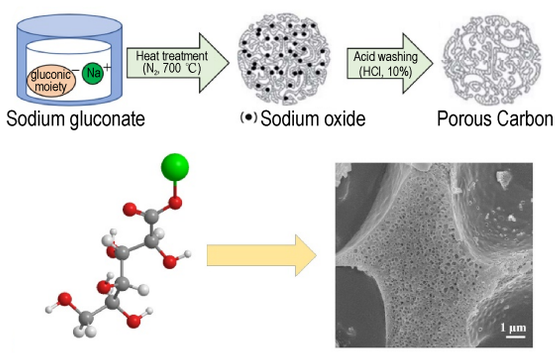
Preparation of Three-Dimensional Graphene Powders and Its Infrared Extinction Properties
LI Hui-ying, WANG Xuan-yu, LIU Zhi-long, SUN Shu-bao, WEI Qing-lian

P1132 Three-dimensional graphene powders were prepared by CVD method, and its morphological and structural characteristics were characterized by scanning electron microscope, Raman Spectrometer and X-Ray Diffractometer. Moreover, its dispersion properties were tested by comprehensive powder characterization instrument. The infrared extinction properties were tested using smoke chamber test and compared with those of composite graphite and carbon fiber.



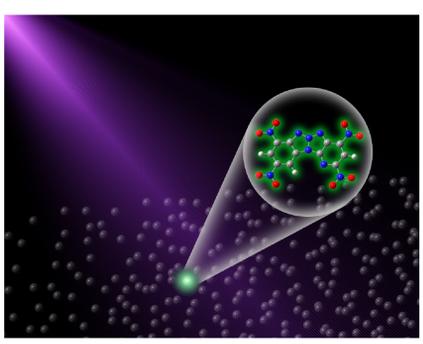
Effects of Preparation Conditions of Carbon Support on the Hydrogenolytic Debenzylation Performance of $Pd(OH)_2$/C Catalysts
NAN Jun-ping, WANG Yu-ling, SONG Jian-wei, WEI Gai-xia, CHEN Yun, DING Xin-lei, DAI Heng-wei, BAI Guang-mei, QIU Wen-ge

P1138 A series of carbon carriers were prepared by a direct carbonization method using sodium gluconate as carbon source and the effects of carbonization temperature, heating rate and additive addition on the structure of carbon support and the catalytic activity of $Pd(OH)_2$/C catalyst in hydrogenolytic debenzylation of HBIW and TADB were studied in detail. The results might provide foundation for development of efficient debenzylation catalyst.



Fluorescence Properties and Fluorescence Stability of BPTAP
LOU Ying-jie, CHEN Jian-bo, DING Huan, LIU Yu, WANG Tao

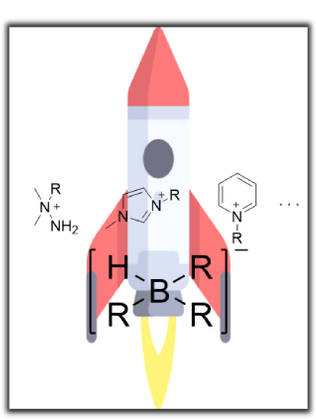
P1147 The fluorescence properties and fluorescence stability of 2,4,8,10-tetrabroitro-benzopyrido-1,3a,6,6a-tetraazapentylene (BPTAP) were studied in this study. Compared with traditional nitro explosives, BPTAP can emit green fluorescence in the dark. BPTAP can keep stable under different conditions except strong alkaline environment. When the pH value is above 9.0, the fluorescence of BPTAP decreases rapidly.



Reviews

Review on Boronium-Anion-Based Hypergolic Ionic Liquids
FU Li-yan, JIAO Bing-jing, WANG Bang-bang, CUI Shang-ping, HAO Yin-wei

P1155 Advances in the design, synthesis, theoretical and applied studies of boronium-anion-based hypergolic ionic liquids were reviewed. The physical chemical properties and application potential of these HILs as well as their advantages and disadvantages were introduced. The current investigation status and future prospects of boronium-anion-based HILs were discussed.



2022 Volume 30, Issue 11 (Sum No. 205)
25 November,2022 (Monthly)

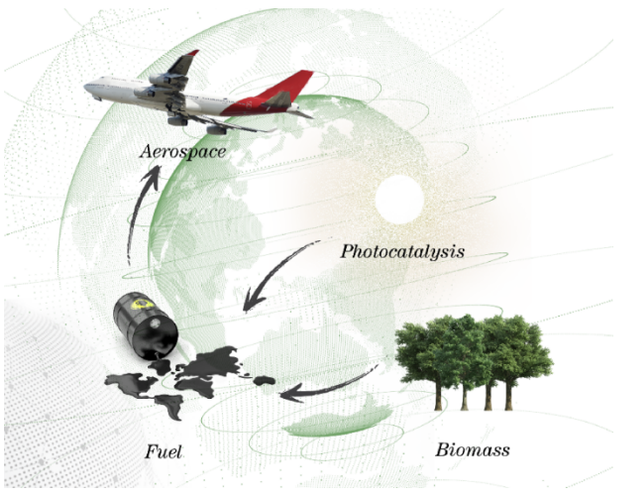
CONTENTS

含能材料
Chinese Journal of Energetic Materials

Review on Green Synthesis of High-Energy-Density Hydrocarbon Fuel

YU Rui, LIU Xian-long, SHI Cheng-xiang, PAN Lun, ZHANG Xiang-wen, ZOU Ji-jun

P1167 The progress in green synthesis of high-energy-density hydrocarbon fuel has been reviewed. The article describes the improvement on the conventional synthesis by using more environmentally friendly catalysts and other measures. Then, the synthesis of high-energy-density hydrocarbon fuel using green biomass feedstock is described. In addition, the application of photocatalytic technology to synthesize fuels with high tension and polycyclic structures is presented.



Review on Imino-bridged Nitrogen-rich Heterocyclic Compounds

ZHOU Zhi-yu, LIAO Si-cheng, LIU Tian-lin, ZHANG Qing-hua

P1177 The construction methods of imino-bridged nitrogen-rich heterocyclic energetic molecular skeletons were reviewed, and the preparation methods, physicochemical properties and detonation properties of these energetic compounds were compared, the future development potential of imino-bridged energetic materials was revealed.