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Effect of Thermoplastic Polyurethane Elastomer on Mechanical Properties of Modified Double-base Propellants

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Abstract: The effect of thermoplastic polyurethane elastomer (TPUE) on mechanical properties of modified double-base propellants was investigated by dynamic mechanical analyzer (DMA) and tensile strength measurement, and its function mechanism was analyzed by scanning electron microscope (SEM). Results show that TPUE remarkably improves mechanical properties of propellants. The elongation of the propellants increases by above 50% at room temperature and high temperature, while at low temperature tensile strength increases by 15% and elongation by 16% because the TPUE enhances the adhesion strength between filler and binder and decreases "de-wetting". The variation of α-relaxation was explained through "free volume theory" and activation energy of relaxation process as well. It is concluded that the mechanical properties at high temperature are related to the magnitude and the activation energy of α-relaxation on tanδ, while those at low temperature are related to activation energy of the β-relaxation on tanδ or "fragility parameter".

Key words: physical chemistry; modified double-base propellant; dynamic mechanical analyzer (DMA); mechanical property; thermoplastic polyurethane elastomer (TPUE)

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会议信息(二)

中国化学会第 26 届学术年会

会议主题: 化学与和谐社会

主要内容: 1. 绿色化学; 2. 环境化学; 3. 化学生物学; 4. 纳米化学; 5. 应用化学; 6. 有机化学; 7. 功能高分子科学前沿; 8. 无机与配位化学; 9. 分析化学; 10. 新能源与能源化学; 11. 不对称催化; 12. 光化学; 13. 胶体与界面化学; 14. 理论化学方法和应用; 15. 化学信息学与化学计量学; 16. 有机固体材料; 17. 超分子组装与软物质材料; 18. 现代核化学与放射化学; 19. 晶体工程; 20. 化学教育; 21. "化学与社会"论坛; 22. 附设"新技术、新产品与新仪器成果展"。

承办单位: 南开大学 时间: 7 月 13 – 16 日 地点: 天津市 联系人: 唐惠(北京市中关村北一街 2 号中国化学会,100080)

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第 8 届材料动力学学术会议

会议内容: 1. 材料动力学的研究现状与发展趋势; 2. 材料的动态本构模型与固体高压状态方程; 3. 冲击相变理论与应用; 4. 材料的动态损伤与断裂; 5. 动载荷下材料的宏观力学特性与细微观响应; 6. 坚固目标的侵彻机理与效应; 7. 含能材料动态力学特性与安全性; 8. 超高速碰撞动力学与空间飞行器防护; 9. 冲击压实、烧结与冲击合成; 10. 材料动力学实验技术与数值模拟技术。

承办单位: 北京理工大学 时间: 5 月底 地点: 安徽省黄山市 联系人: 陈利(北京理工大学宇航科学技术学院,100081)

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