

Preparation and Performance of Self-healing Binder Based on GAP

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Abstract: To prolong the storage life of binder, the poly(glycidyl azide) ether (GAP)-based binders with self-healing performance were firstly synthesized by introducing disulfide functional group into an azide binder through an one-step method. Fourier transform infrared spectroscopy (FTIR), X-ray diffractometry (XRD) and optical microscopy were used to characterize its structure and surface topography characterization. On this basis, the self-healing efficiency under different self-healing temperature and different self-healing time was examined through the change of tensile strength before and after self-healing. Results show that the synthesized GAP-based self-healing binder has a polyurethane structure, the surface cracks of self-healing binder are completely healed after 24 h at 60 °C. Increasing the temperature and prolonging the self-healing time are helpful to improve the self-healing efficiency. At the same time, the self-healing efficiency is firstly improved and then decreased with increasing mass fraction of the cross-linking agent, in which, the self-healing efficiency for the formula with a cross-linker mass fraction of 8% can reach 98%. Compared with control sample with the self-healing efficiency as 61.7%, which proves that the introduction of disulfide functional groups can improve the self-healing efficiency of the system.

Key words: poly(glycidyl azide) ether (GAP); self-healing; disulfide bond; binder

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《含能材料》“损伤与点火”专栏征稿

含能材料的损伤特征与点火过程有密切的联系,炸药、推进剂的内部损伤及其对力学特性、安全特性和点火行为的影响规律受到了含能材料学界的高度重视,为推动这一重要研究方向的学术交流,本刊特设立“损伤与点火”专栏。专栏主要征集炸药、推进剂等含能材料的损伤观测与多尺度表征技术、含损伤的本构方程、准静态与动态损伤演化规律、损伤与破坏的宏(细)观模式、损伤对起爆、爆炸、爆轰成长以及非冲击起爆行为的影响等方向的原创性研究论文。来稿请注明“损伤与点火”专栏。

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