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Thermal Decomposition Behavior of Dihydrazinium Salt of Bis(5-amino-1,2,3,4-tetrazolium)

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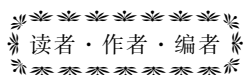
Abstract: In order to understand comprehensively the thermal decomposition behavior of dihydrazinium salts of bis(5-amino-1,2,3,4-tetrazolium) (Hy_2BTA), thermal decomposition curves at different heating rates and the types of decomposition gas products and their content change of the compound were measured by combined method of thermogravimetry-differential scanning calorimetry-Fourier transform infrared spectroscopy-mass spectrometry (TG-DSC-FTIR-MS). Results show that the thermal decomposition of Hy_2BTA includes two endothermic processes and two successive exothermic processes with temperature increasing, corresponding to the broken of first ionic bond in Hy_2BTA with the expulsion of NH_2NH_2 , the tetrazole rings began to release N_2 with the rupture of $-\text{N}-\text{N}-$ during the break of the second ionic bond in Hy_2BTA , gas products N_2 , HN_3 , NH_3 and HCN were generated by the cleavage of tetrazole rings and the further decomposition of residual skeleton, in addition, the polymerization of decomposition products and pyrolysis of residual skeleton can be occurred which produce polymer containing nitrogen and HN_3 , N_2 and NH_3 , respectively. The apparent activation energies of four processes calculated by Kissinger's method are $115.12 \text{ kJ} \cdot \text{mol}^{-1}$, $193.75 \text{ kJ} \cdot \text{mol}^{-1}$, $334.16 \text{ kJ} \cdot \text{mol}^{-1}$ and $243.40 \text{ kJ} \cdot \text{mol}^{-1}$ respectively.

Key words: dihydrazinium salt of bis(5-amino-1,2,3,4-tetrazolium); TG-DSC-FTIR-MS coupled technique; thermal decomposition; gas products

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含能共晶是不同含能分子通过氢键等相互作用力形成的具有稳定结构和性能分子晶体。含能共晶充分组合了单质含能分子的优点,呈现出感度低,综合性能优良的特点,具有潜在的应用前景,共晶研究已经引起国内外含能材料学界的高度关注。为推动含能共晶的研究和交流,本刊特推出“含能共晶”专栏,主要征稿范围包括含能共晶晶体设计与性能预测、含能共晶的制备、结构解析、性能等。来稿请注明“含能共晶”专栏。

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