

## Quasi-static Compression Properties and Impact Energy Release Characteristics of Al/PTFE/W Reactive Materials

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**Abstract:** To improve the impact reaction damage effectiveness of Al/PTFE/W fluoropolymer-matrix reactive materials (RMs), quasi-static compression experiments of Al/PTFE/W RMs were carried out. The effects of W content (0%, 30%, 65%), Al particle size (13, 45, 75  $\mu\text{m}$ ) and PTFE particle size (25, 160  $\mu\text{m}$ ) on the quasi-static mechanical properties of the RMs were analyzed. The impact energy release test of the RMs was performed by quasi-sealed reaction vessel, the impact reaction pressure and duration of energy release of the RMs in the range of 750–1200  $\text{m} \cdot \text{s}^{-1}$  were measured. The influence of Al particle size and PTFE particle size on the impact reaction energy release characteristics was analyzed. Results show that when the contents of W are 0%, 30% and 65%, the failure strength of the RMs is 55.6, 64.8 and 22.8 MPa respectively, and the change in W content has little effect on the yield strength. When the size of Al particles decreases from 75  $\mu\text{m}$  to 13  $\mu\text{m}$ , the failure strength of the RMs increases from 64.7 MPa to 83.1 MPa, the range increases by 28.4%. Increasing the particle size of the PTFE matrix material can also effectively improve the failure strength of the reactive material. The initial reaction pressure threshold and the duration of energy release of the RMs are affected by the particle size and quasi-static compressive mechanical properties of the materials.

**Key words:** fluopolymer based reactive material; quasi-static compression properties; quasi-sealed reaction vessel; impact reaction pressure; duration of energy release

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