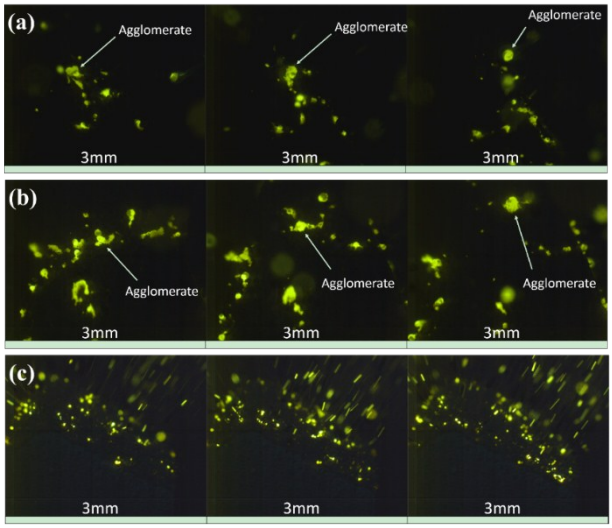
Supplementary materials

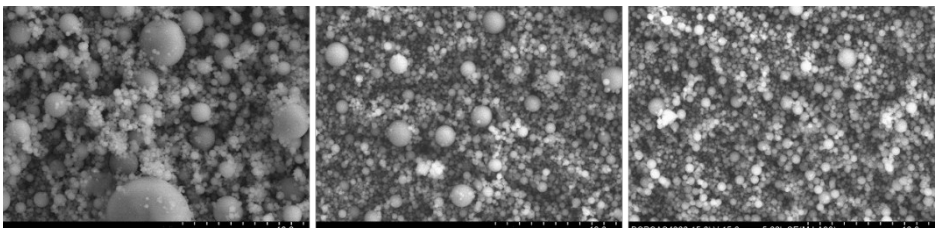
According to some research works, PTFE is always suggested to be a good additive to suppress Al agglomeration in solid composite propellant. To better compare the effect of PTFE and $Fe(PFO)_3$, some extended and contrastive characterizations were performed on the aluminized HTPB propellant separately containing $Fe(PFO)_3$ and raw PTFE powder. The related results are stated here including particle size analysis of solid combustion products, the successive snapshots of combustion process, and morphology of solid combustion products separately corresponding to **Suppl. 1**, **Suppl. 2** and **Suppl. 3**.

Suppl. 1 Particle-size distribution parameters of collected solid combustion products.

Samples	Particle-size distribution parameters			Sum volume fraction (%, D≥10 μm)
	D_{10} (μm)	D_{50} (μm)	D_{90} (μm)	
S_0	0.19	2.36	**35.04**	27.48
$S_{3\%PTFE}$	0.31	4.63	**15.55**	19.26
$S_{3\%FePFO3}$	0.21	2.33	**9.35**	10.95



Suppl. 2 Burning surface characteristics corresponding to S_0 (a), $S_{3\%PTFE}$ (b) and $S_{3\%FePFO3}$ (c); it can clearly be seen that $S_{3\%FePFO3}$ suppressed combustion agglomeration on surface much better than both S_0 and $S_{3\%PTFE}$.



Suppl. 3 Morphology of solid combustion product corresponding to S_0 (left), $S_{3\%PTFE}$ (middle) and $S_{3\%FePFO3}$ (right), small particle size also indicates higher combustion efficiency in experience.

The effects of $Fe(PFO)_3$ and raw PTFE powders as additive were compared. The results show that PTFE presented some agglomeration-reducing effect but not as good as $Fe(PFO)_3$. We attribute this to that, in the research works of others, PTFE was usually suggested to be ball-milled with aluminum as a composite metal fuel firstly and then to be employed in the propellant formulation, however, there is no modification on the PTFE powder in our work.