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Research paper

Study on the Effect of Energetic Thermoplastic Polyurethane Elastomer on the Thermal Decomposition Performance of 5-AT/NC Energetic System

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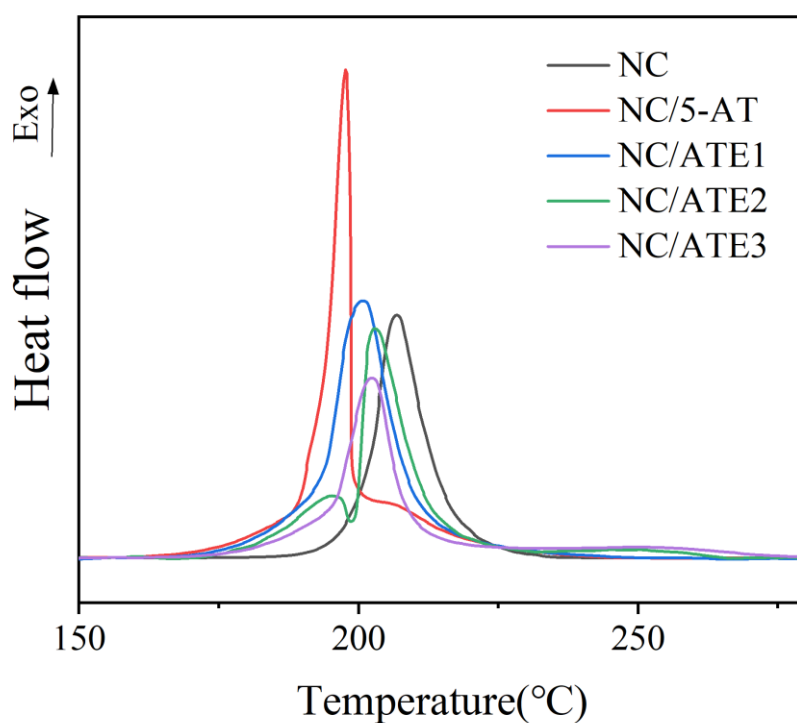


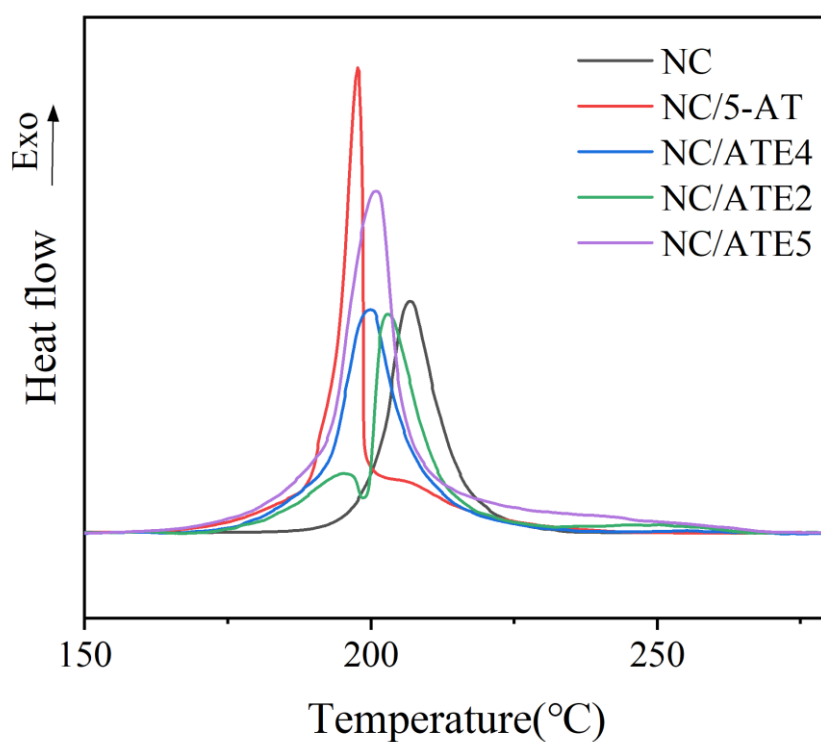
Fig. S1. The DSC curves of NC with ATE1, ATE2, and ATE3

Samples ATE1, ATE2, and ATE3 were prepared under different ETPE contents (0.125 g, 0.15 g, 0.175 g), respectively. The DSC curves of the NC/ATE samples are shown in the Fig.S1.

The surfaces of all ATE samples were coated with ETPE, and the decomposition temperatures of all NC/ATE samples increased. However, the 5-AT small particles on the surface of the ATE sample promote decomposition with NC, causing the peak temperature to shift forward. Among them, there are more 5-AT small particles on the surface of ATE1, and the peak temperature shifts forward more.

Table S1. Decomposition peak temperature of NC with ATE1, ATE2, and ATE3

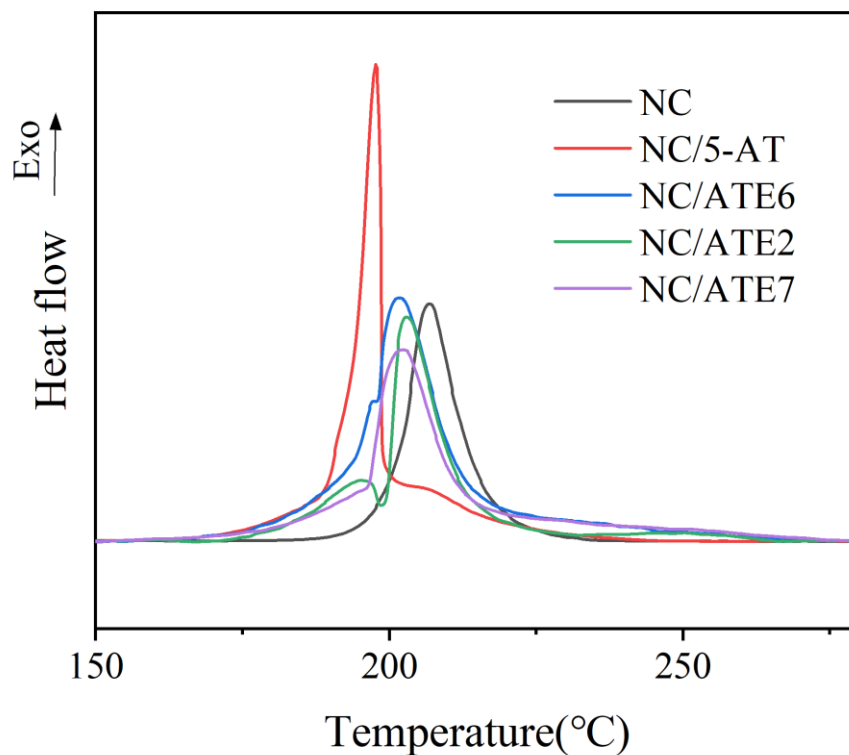
Sample	Decomposition peak temperature (°C)
NC	206.8
NC/5-AT	197.9
NC/ATE1	201.5
NC/ATE2	202.9
NC/ATE3	202.4

**Fig.S2.** The DSC curves of NC with ATE4, ATE2, and ATE5

Samples ATE2, ATE4, and ATE5 were prepared under different temperatures (30 °C, 50 °C, and 70 °C) respectively. The DSC curves of the NC/ATE samples are shown in the Fig.S2. As the temperature of the experimental preparation rises, the surface of the ATE sample becomes rough, making it prone to contact with NC and promoting decomposition. The higher the temperature of the ATE preparation experiment, the lower the decomposition temperature of NC/ATE.

Table S2. Decomposition peak temperature of NC with ATE2, ATE4, and ATE5

Sample	Decomposition peak temperature (°C)
NC	206.8
NC/5-AT	197.9
NC/ATE2	202.9
NC/ATE4	200.0
NC/ATE5	199.0

**Fig.S3.** The DSC curves of NC with ATE6, ATE2, and ATE7

Samples ATE6, ATE2, and ATE7 were prepared under different stirring rates (800 r/min, 875 r/min, and 900 r/min) respectively. The DSC curves of the NC/ATE samples are shown in the Fig.S3. There were more 5-AT particles on the surfaces of samples ATE2 and 6. The abundant 5-AT and NC mutually promoted decomposition. The ATE7 sample is relatively completely

coated, with no 5-AT particles on the surface. However, during the heating process, 5-AT melts due to heat and may overflow from the loose ETPE coating layer, come into contact with NC and promote decomposition, causing the peak temperature to shift forward.

Table S3. Decomposition peak temperature of NC with ATE6, ATE2, and ATE7

Sample	Decomposition peak temperature (°C)
NC	206.8
NC/5-AT	197.9
NC/ATE2	202.9
NC/ATE6	201.8
NC/ATE7	202.3

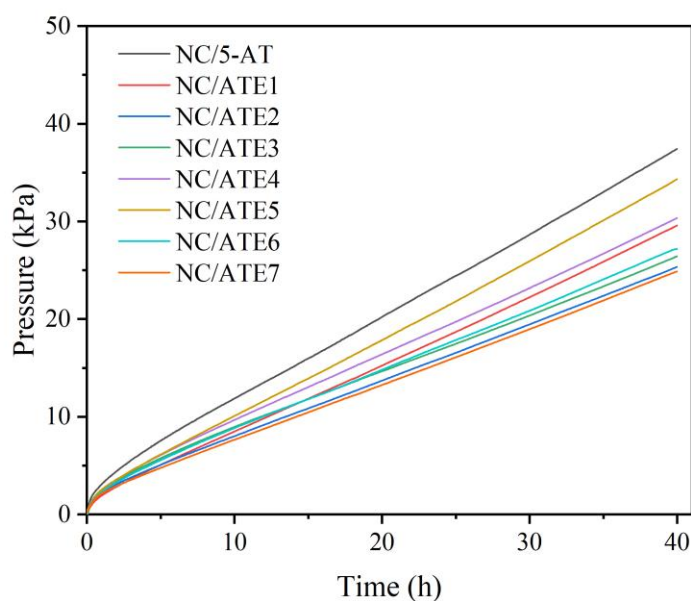


Fig.S4 The VST curves of NC and ATE samples.

The VST curves of the NC and ATE samples are shown in the Fig.S4. The gas release volume of NC/ATE2 is less than that of ATE1 and ATE3. The coating effect of ATE4 and ATE5 is poor, and the gas release is relatively high. The NC/ATE7 has the least gas release volume.

The better coating effect hindered the contact between NC and 5-AT, weakening the mutual promoting reaction between NC and 5-AT.

Table S4. The evolved gases and compatibility evaluation of each sample

sample	Gas volume release (mL)	Net increase (mL)
NC/5-AT	7.4817	7.3520
NC/ATE1	6.0297	5.6831
NC/ATE2	5.1816	4.835
NC/ATE3	5.3993	5.0527
NC/ATE4	6.1819	5.8353
NC/ATE5	6.9776	6.6310
NC/ATE6	5.5800	5.2034
NC/ATE7	5.0892	4.7426

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