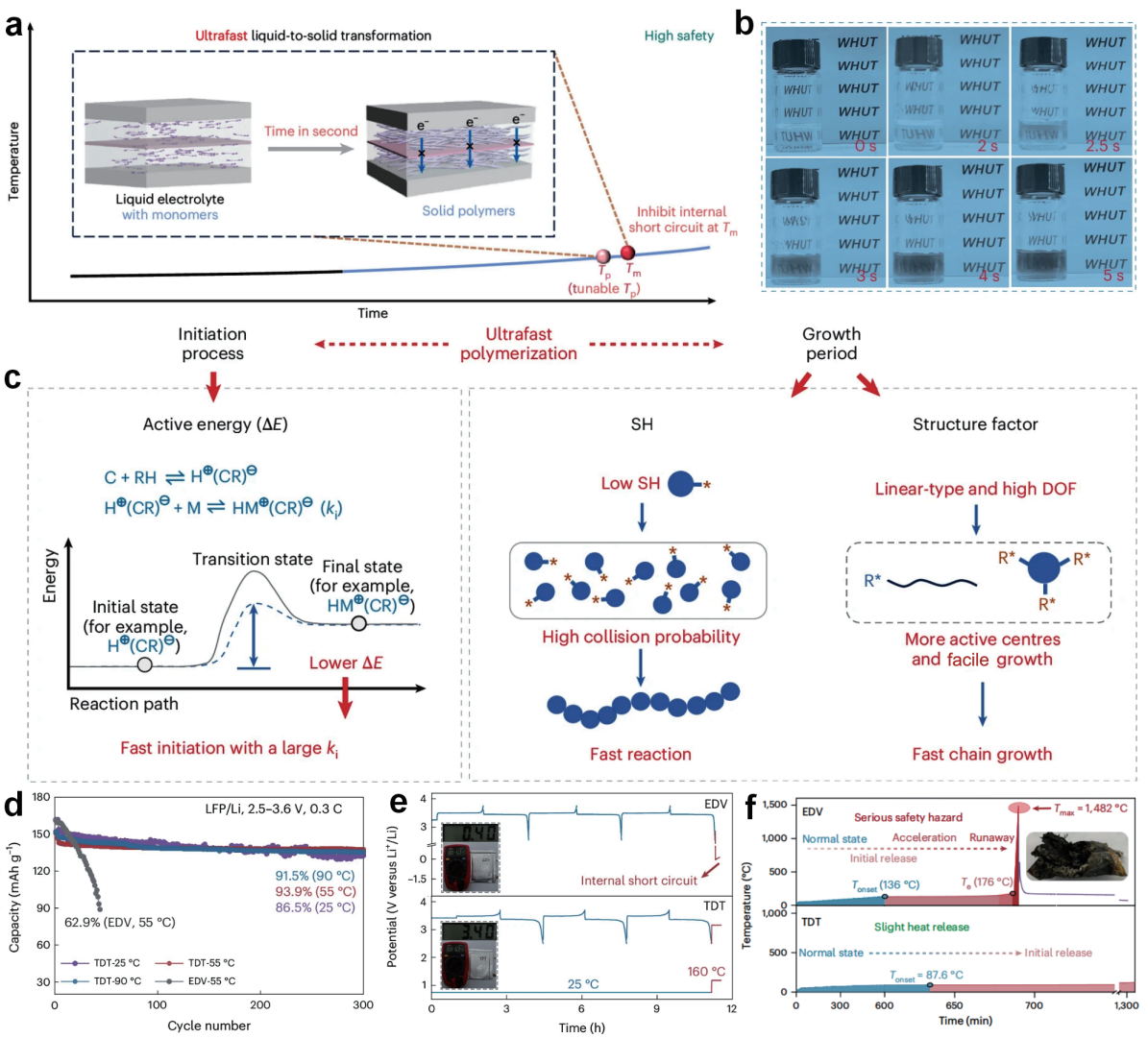
a
Ultrafast liquid-to-solid transformation
High safety
Temperature
Time in second
Liquid electrolyte
with monomers
Solid polymers
Inhibit internal
short circuit at T_m
T_p
T_m
(tunable T_p)
Time
b
WHUT
0 s
2 s
2.5 s
3 s
4 s
5 s
Initiation
process
Ultrafast
polymerization
Growth
period
c
Active energy (ΔE)
C + RH ⇌ H⊕(CR)⊖
H⊕(CR)⊖ + M ⇌ HM⊕(CR)⊖ (k_i)
Energy
Transition state
Final state
(for example,
HM⊕(CR)⊖)
Initial state
(for example,
H⊕(CR)⊖)
Lower ΔE
Reaction path
Fast initiation with a large k_i
SH
Low SH
High collision probability
Fast reaction
Structure factor
Linear-type and high DOF
R*
More active centres
and facile growth
Fast chain growth
d
LFP/Li, 2.5–3.6 V, 0.3 C
Capacity (mAh g^{-1})
91.5% (90 °C)
93.9% (55 °C)
86.5% (25 °C)
62.9% (EDV, 55 °C)
TDT-25 °C
TDT-55 °C
TDT-90 °C
EDV-55 °C
Cycle number
e
EDV
Internal short circuit
TDT
160 °C
25 °C
Potential (V versus Li$^+$/Li)
Time (h)
f
EDV
Serious safety hazard
T_{max} = 1,482 °C
Normal state
Acceleration
Runaway
Initial release
T_{onset} (136 °C)
T_e (176 °C)
TDT
Slight heat release
Normal state
Initial release
T_{onset} = 87.6 °C
Temperature (°C)
Time (min)