Mitglied der Helmholtz-Gemeinschaft

fortgeschrittene elektrochemische Konzepte für Lithiumionen-Batterien mit verbesserter Sicherheit

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IEK-9: Fundamental Electrochemistry
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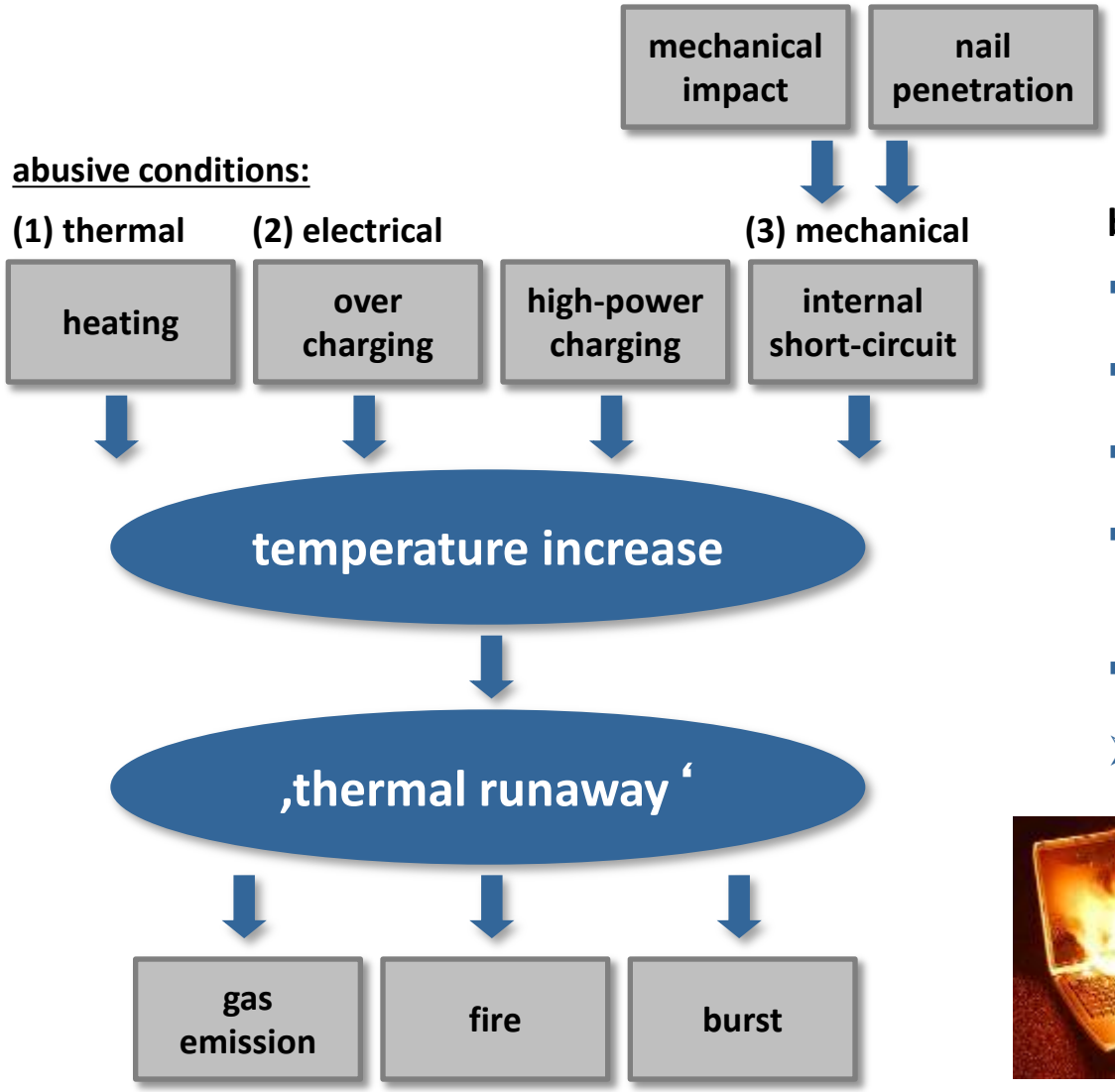
battery safety: thermal runaway



battery safety

- thermal and mechanical impact
- over-(dis)charge
- $Li_{1-x}CoO_2$: instability for x > 0.5
- disproportionation reaction
  $Li_{0.5}CoO_2 \rightarrow 1/2\ LiCoO_2 + 1/6\ Co_3O_4 + 1/6\ O_2$
- electrolyte breakdown into flammable gases

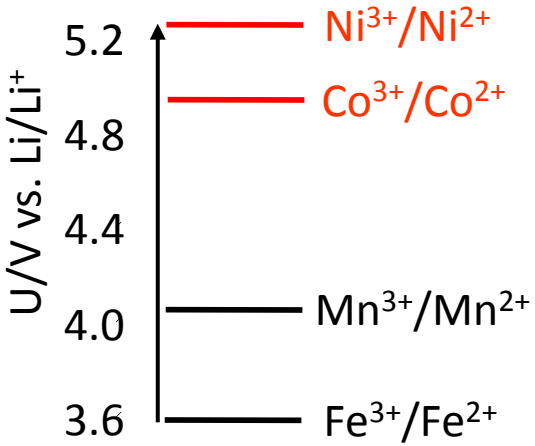
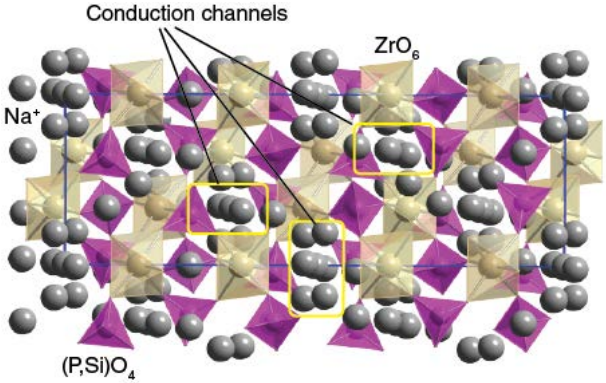
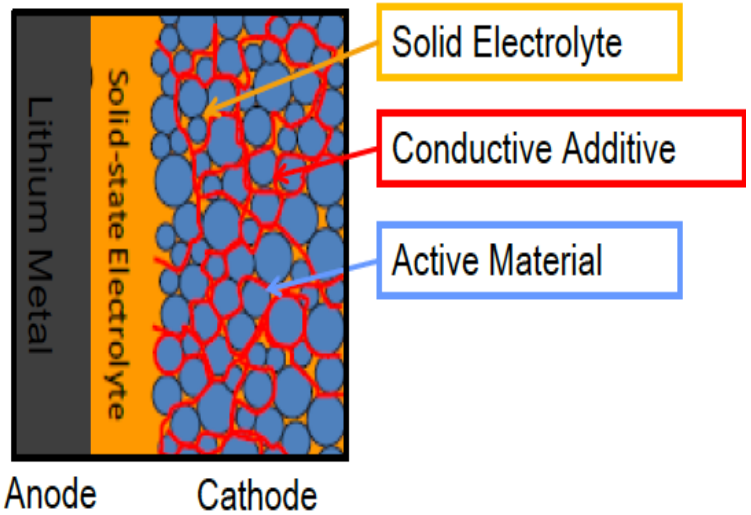
➢ **electrolyte as key component**

strategies for enhanced safety

(1) safe alternative: phosphoolivines $LiMPO_4$ (M=Mn,Fe,Co,Ni)

- Triphylite: $LiFePO_4$

- Heterosite: $FePO_4$



(2) safe alternative: solid-state electrolyte