

High-performance Photopolymerized Gel Electrolyte Developed for Solid-state Sodium Metal Batteries

Sodium (Na) has similar properties to lithium (Li), but is much more abundant and widely distributed, which make sodium-ion batteries (SIBs) a highly competitive alternative to lithium-ion batteries (LIBs).

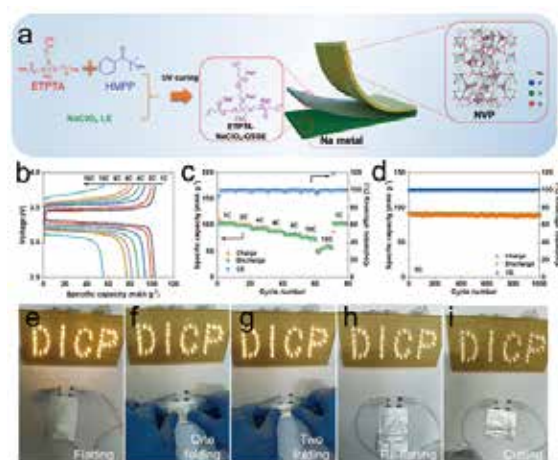
As a kind of metal with high theoretical capacity and a low redox potentials, sodium is regarded as an ideal anode material of SIBs with high output voltage and energy density. However, sodium metal batteries (SMBs) in organic electrolyte systems still suffer from serious safety issues, such as the leakage of electrolyte, and dendrite formation of Na.

Recently, a research team led by Prof. WU Zhongshuai from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences developed a photopolymerized gel electrolyte with high room-temperature ionic conductivity, wide electrochemical window and excellent flexibility for ultra-high rate and ultra-long cycling sodium metal batteries.

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“We developed an ethoxylated trimethylolpropane triacrylate based quasisolid-state electrolyte by photopolymerization for high-energy-density solid-state SMBs,” said Prof. WU.

The resulting electrolyte exhibited remarkable room-temperature ionic conductivity of 1.2 mS cm^{-1} , and provided a wide electrochemical window of $>4.7 \text{ V}$ versus



Photopolymerized gel electrolyte with unprecedented room-temperature ionic conductivity for high-energy-density solid-state sodium metal batteries was developed. (Image by DICP)

Na^+/Na as well as extraordinary interfacial compatibility with Na metal anodes, effectively inhibiting the growth of Na dendrites.

Moreover, the as-assembled solid-state SMBs offered high specific capacity of 101 mAh/g at 1 C , and record rate performance at room temperature.

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(DICP)

Reference

Pengchao Wen, Pengfei Lu, Xiaoyu Shi, Yu Yao, Haodong Shi, Hanqing Liu, . . . Zhong-Shuai Wu, (2021) Photopolymerized gel electrolyte with unprecedented room-temperature ionic conductivity for high-energy-density solid-state sodium metal batteries. *Advanced Energy Materials* 11, 2002930. doi: 10.1002/aenm.202002930.