All Solid-state Flexible Battery with Fast-charging

Lin, Yan (School: Tsinghua University High School)

Commercial lithium-ion battery (LIB) is currently the dominating power source for the portable electronic devices and electric vehicles. However, the further application of LIB has been hampered by some safety issues and long charging time. To overcome these problems, my research work, inspired by the working mechanism of traditional dielectric capacitor, introduces a porous film with high-polarization ability to absorb Li+-carrying electrolyte to act as composite electrolyte for designing and assembling a new solid-state flexible battery. In this work, as-assembled solid-state battery by using highly polarized porous film shows much enhanced electric performance that the charging energy-density degree can reach to 90% versus that of the fully charged state at a short charging time of 36 s, which is one point five times that of traditional battery. Moreover, as-assembled solid-state battery shows excellent flexibility that it can be bended for 100 times without any electric performance decay. The final experimental results indicate that the use of highly-polarized porous film in my solid-state battery can be beneficial for the formation of local built-in electric field to facilitate the fast transport of ion, thus improving the rate performance of battery.