

# Supporting Information

**Crystalline Al<sub>2</sub>O<sub>3</sub> modified porous poly(aryl ether ketone) (PAEK) composite  
separators for high performance lithium-ion batteries via electrospinning  
technique**

Hai Li,<sup>a</sup> Dawei Luo,<sup>a,b</sup> Jialing He,<sup>d</sup> Feng Lin,<sup>b</sup> Hao Wang,<sup>a</sup> Liang Yu,<sup>a</sup> Wei Liu,<sup>a,\*</sup> and

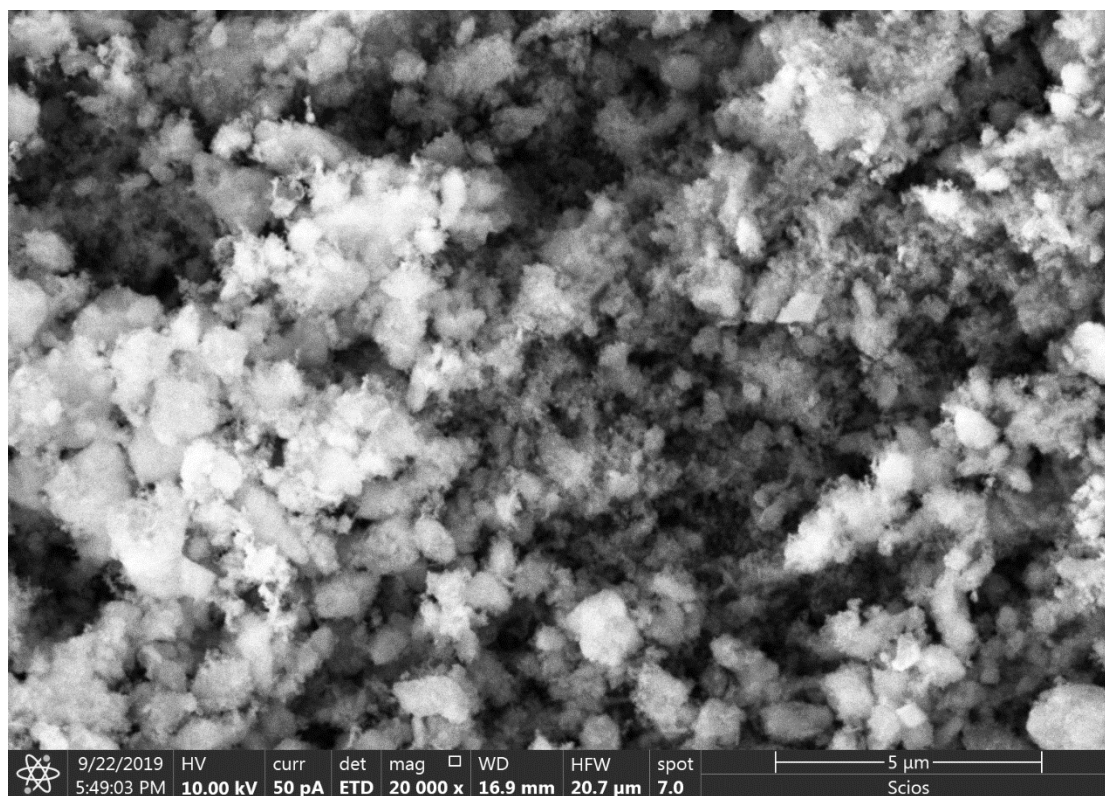
Jing Li,<sup>c,a,\*</sup>

<sup>a</sup>Hoffmann Institute of Advanced Materials, Shenzhen Polytechnic, 7098 Liuxian Blvd,  
Nanshan District, Shenzhen, 518055, China

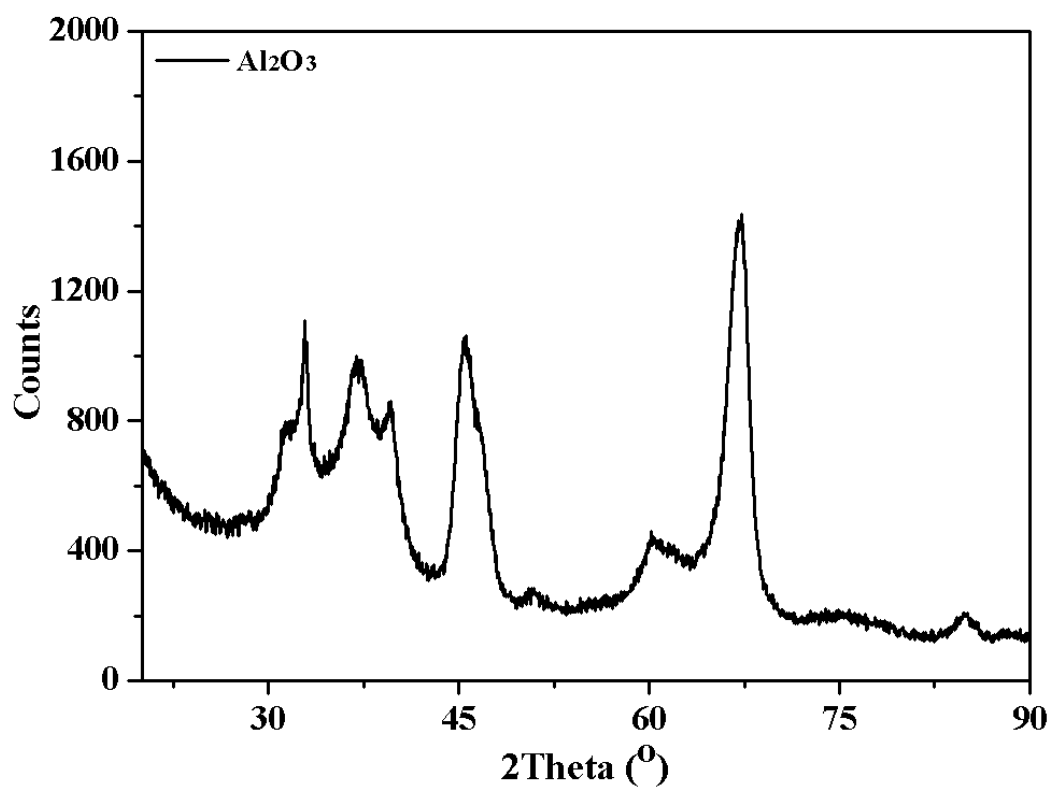
<sup>b</sup> School of Applied Chemistry and Biological Technology, Shenzhen Polytechnic,  
7098 Liuxian Blvd, Nanshan District, Shenzhen, 518055, China.

<sup>c</sup> Department of Chemistry and Chemical Biology, Rutgers University, 123 Bevier  
Road, Piscataway, NJ, 08854, USA

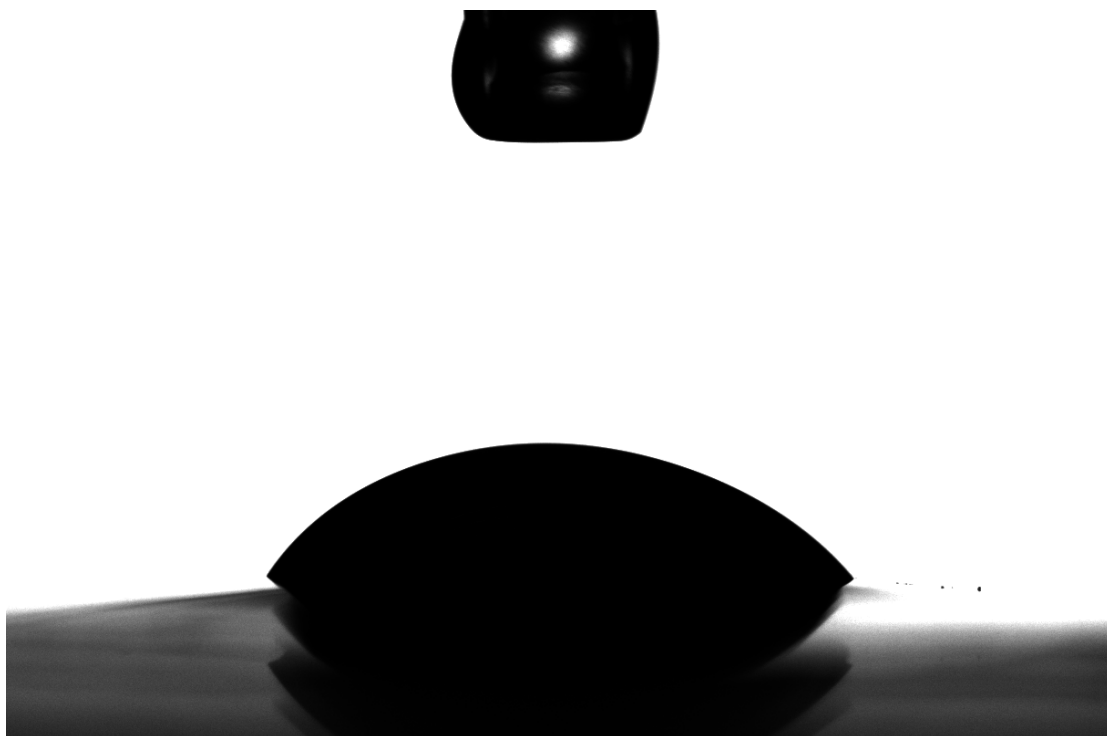
<sup>d</sup> Library of Shenzhen Polytechnic, Shenzhen Polytechnic, 7098 Liuxian Blvd, Nanshan  
District, Shenzhen 518055, China



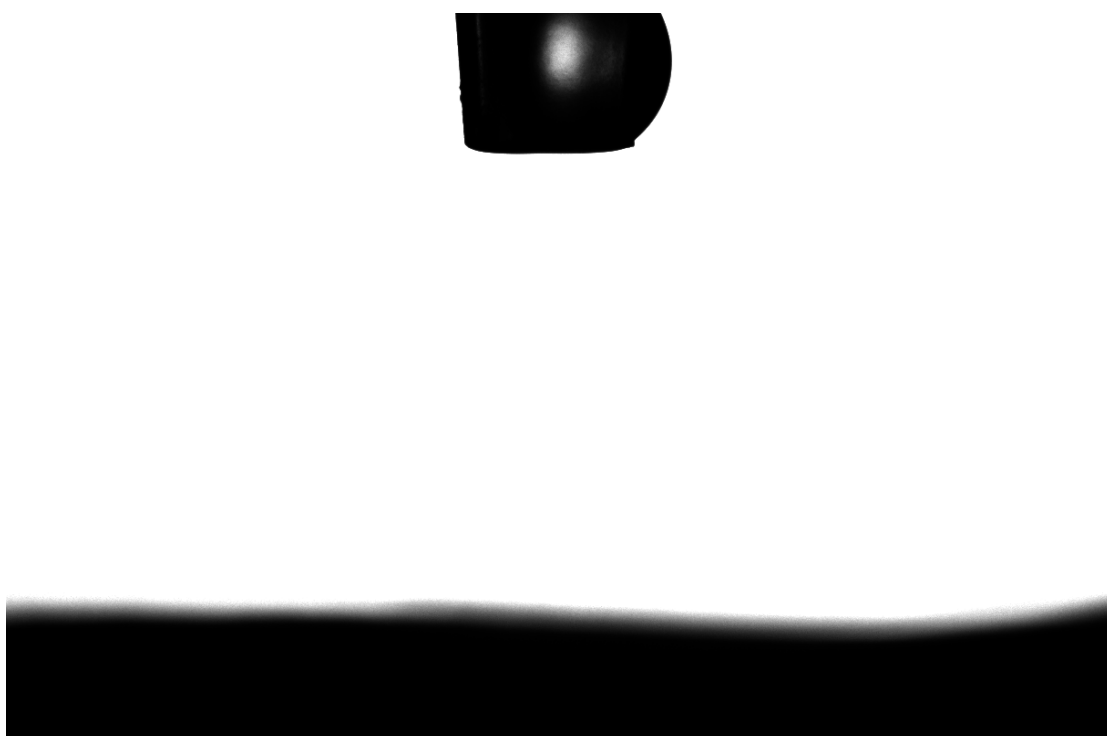
**Figure S1.** The surface morphology of crystalline  $\text{Al}_2\text{O}_3$  nanoparticles.



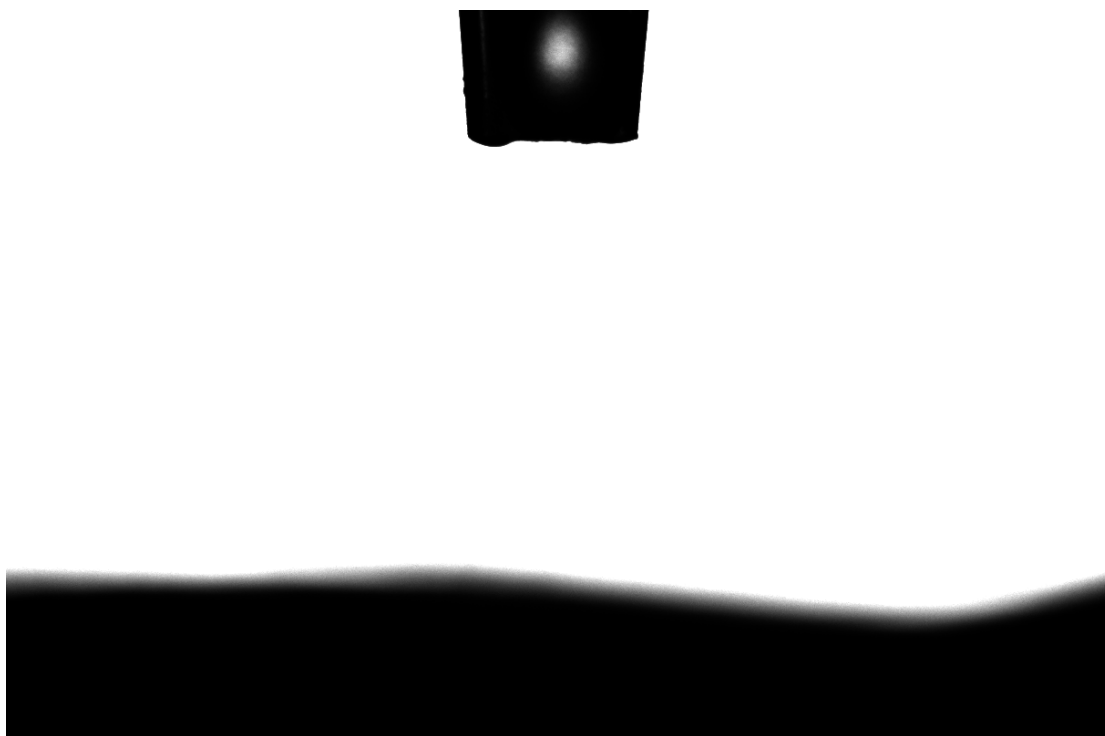
**Figure S2.** The PXRD image of crystalline  $\text{Al}_2\text{O}_3$  nanoparticles.



**Figure S3.** The CA image of commercial PP separator.

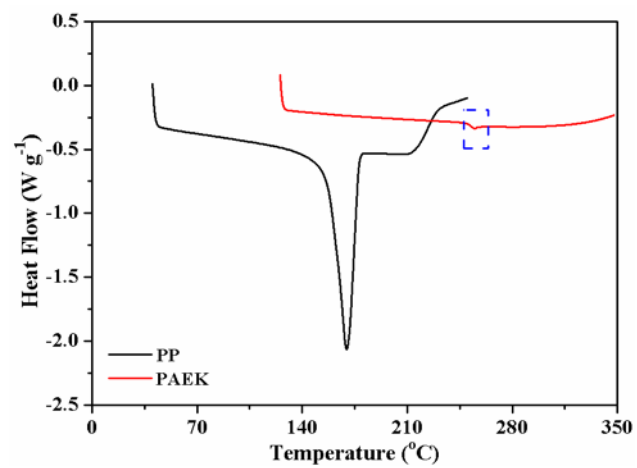


**Figure S4.** The CA image of commercial PAEK separator.



**Figure S5.** The CA image of commercial PAEK-Al<sub>2</sub>O<sub>3</sub> separator.

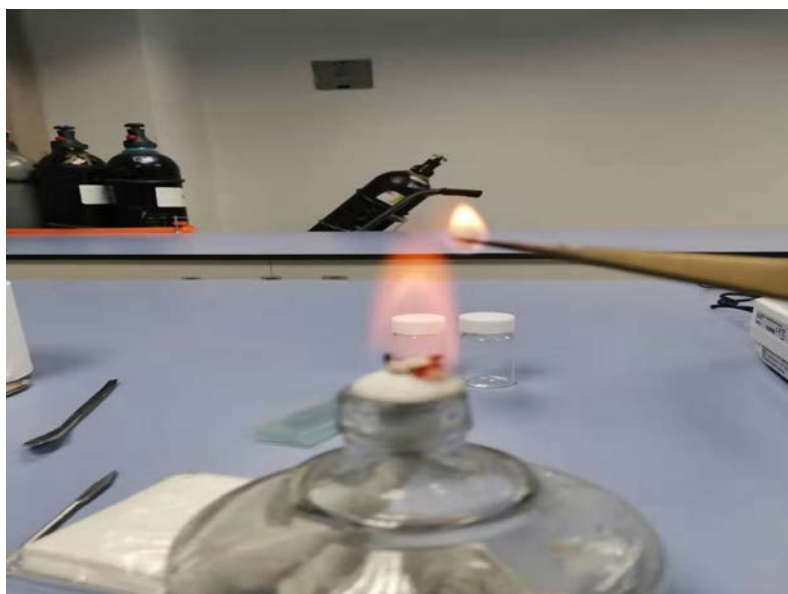
The contact angle (CA) was examined, as shown above. The electrolyte droplets readily wetted a wide area of the electrospun non-woven fibrous PAEK-base separators, giving CAs near 0°. In contrast, the surface of the commercial PP separator was not completely wetted and had a CA of 45°, which was much higher than the CAs of the electrospun porous fiber separators. Both wettability measurements proved that the electrospun PAEK-base separators including PAEK and PAEK-Al<sub>2</sub>O<sub>3</sub> were more compatible with the electrolyte than the non-polar PP separator, and this property is beneficial for transporting lithium ions between the electrodes through the LIB separator. Better lithium ion transport can enhance the electrochemical performance, especially the rate performance.



**Figure S6.** DSC curves of the electrospun PAEK separator and the commercial PP separator.



**Figure S7.** Flammability of commercial PP separator.



**Figure S8.** Flammability of electrospun PAEK separator.



**Figure S9.** Flammability of electrospun PAEK-Al<sub>2</sub>O<sub>3</sub> composite separator.