Polyimide matrix enhanced cross-linked gel separator with
three-dimensional heat-resistance skeleton for high safety and
high power lithium ion battery

Junli Shi, Huasheng Hu, Yonggao Xia*, Yuanzhuang Liu and Zhaoping Liu*

Ningbo Institute of Materials Technology Engineering (NIMTE), Chinese Academy
of Sciences, Zhejiang, P. R. China, 31520. E-mail: xiayg@nimte.ac.cn;
liuzp@nimte.ac.cn

The tensile curves of separators were obtained from a tensile tester (RGWT-4002,
Shenzhen, China). The test was operated at room temperature with stretching rate
being 200 mm min\(^{-1}\) and the sample size is 30 mm×10 mm.

![Tensile curves](image)

**Fig. S1** The tensile curves of the composite separator and the PI nonwoven substrate.

The mechanical strength of the composite separator and the PI nonwoven substrate
are evaluated by determining the tensile curves. The result is shown in Fig. S1. The breaking elongation of the PI substrate is 21.5%, and the tensile strength is 19.2 MPa. When the crosslinked PEO was introduced to form the semi-penetrating polymer network, the mechanical strength is enhanced. The breaking elongation and tensile strength of the composite separator is 22.7% and 25.7 MPa, respectively. Since the nonwoven separators have been proved to satisfy the mechanical strength requirements in use, the composite separator could also show proper mechanical strength for the application in lithium ion batteries.