



第三届新型电池电解质/隔膜材料技术国际论坛

The Third International Forum on Electrolyte & Separator for Advanced Batteries

关于动力锂离子电池隔膜性能改进的探讨

Discussion on the improvement of separator
performance of power lithium ion battery

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CHINA AVIATION LITHIUM BATTERY CO., LTD.



CATALOG

1. 隔膜的耐高温性能要求

Performance requirements for high thermal resistance of separator

2. 隔膜的粘结性能要求

Performance requirements for adhesive property of separator

3. 工艺过程对隔膜表面质量的要求

Process requirements for surface quality of separator

4. 工艺过程对隔膜机械强度的要求

Process requirements for mechanical strength of separator



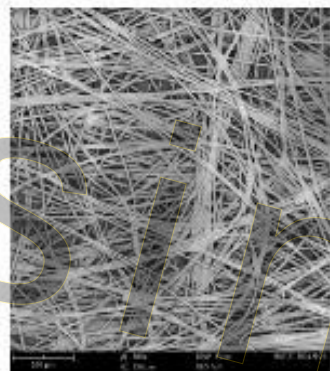


Performance requirements for high thermal resistance of separator

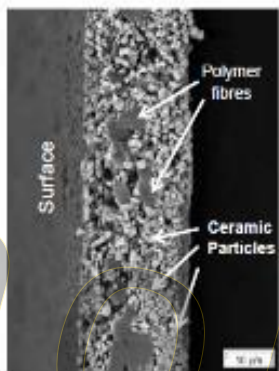




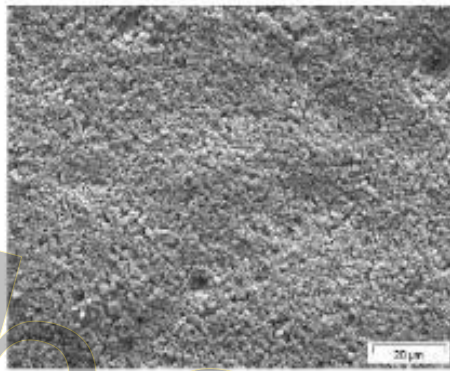
PET无纺布



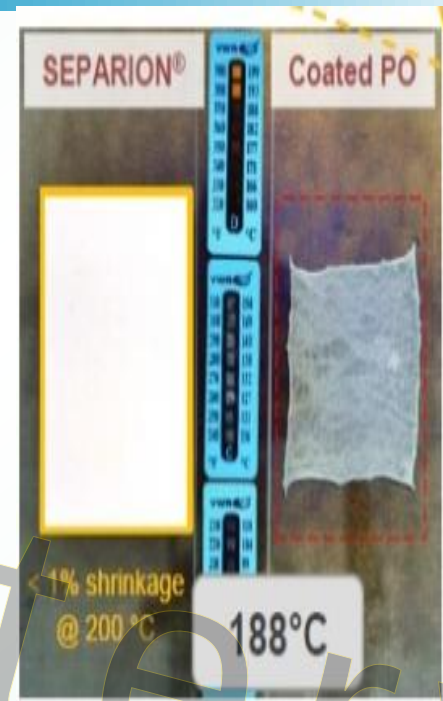
PET non-woven support



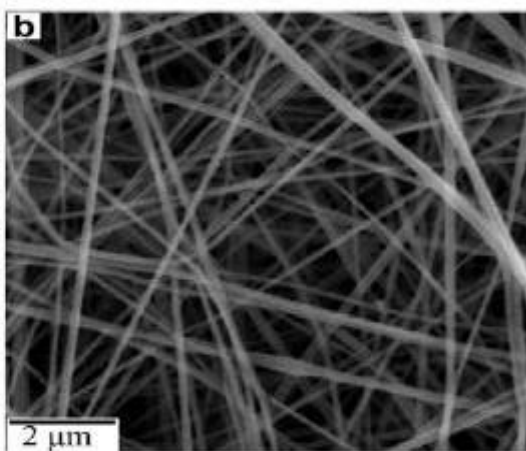
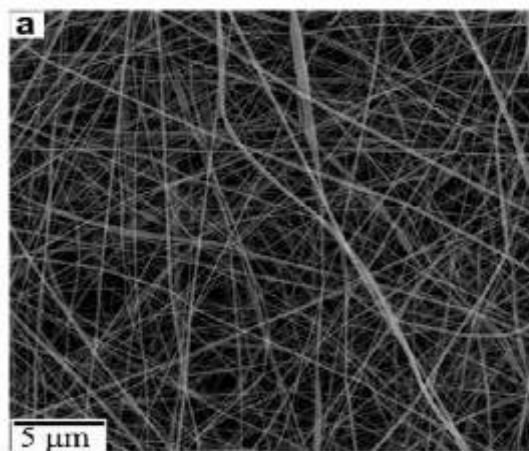
Flexible ceramic separator
(SEM cross-section)



Ceramics
(Surface view)

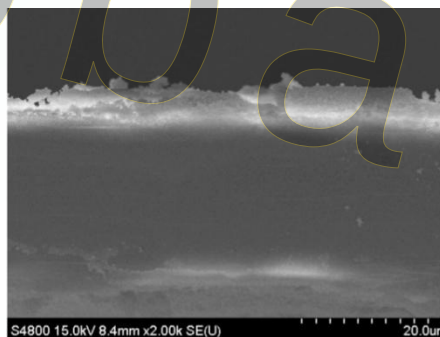
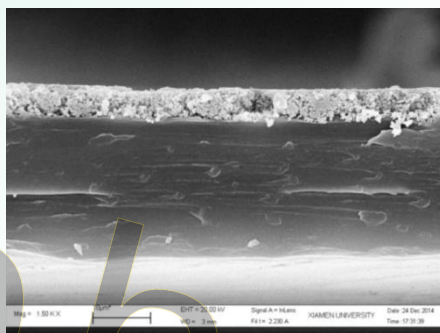
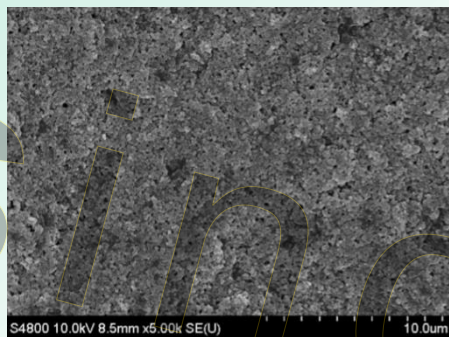


PI电纺





PE/PP隔膜表面涂敷



Jinbao Zhao. *Energy Environ. Sci.* 2016, 9, 3252-3261

通过多巴胺复合粘结剂制备改性陶瓷隔膜的方法及其应用,

申请号: 201710059625.9



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Performance requirements for high thermal resistance of separator

- 200℃/30min条件下
- 隔膜热收缩 $\leq 3\%$
- 隔膜保持完整，不破碎和破裂
- 隔膜穿刺强度 $\geq 50\text{N}$





Performance requirements for adhesive property of separator

电池性能

高比能
高安全

电池需求

良好
循环性

隔膜需求

浸润性
粘结性



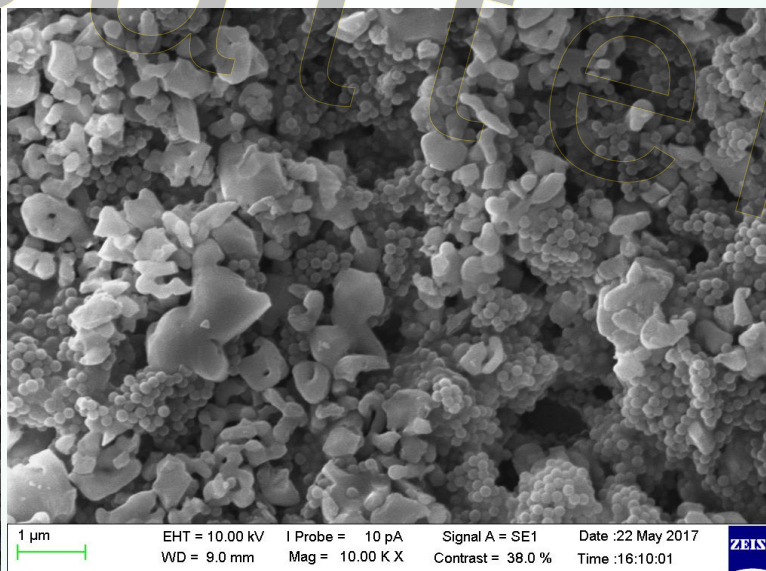
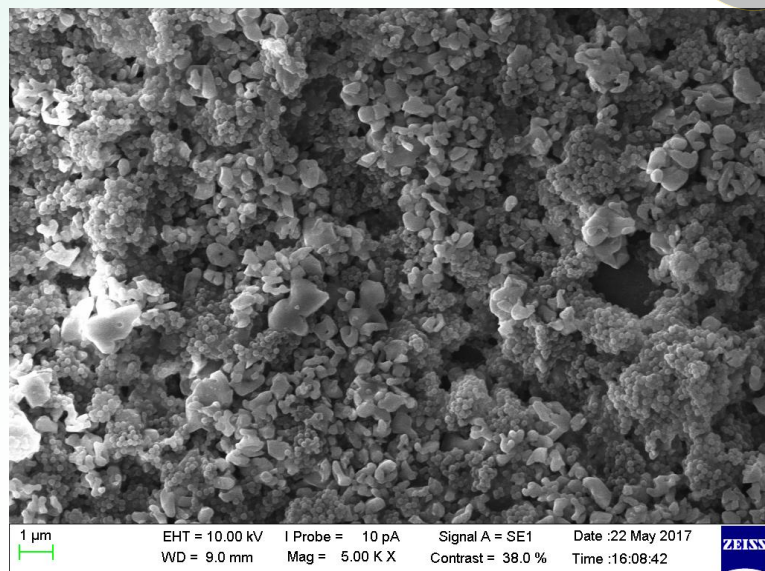
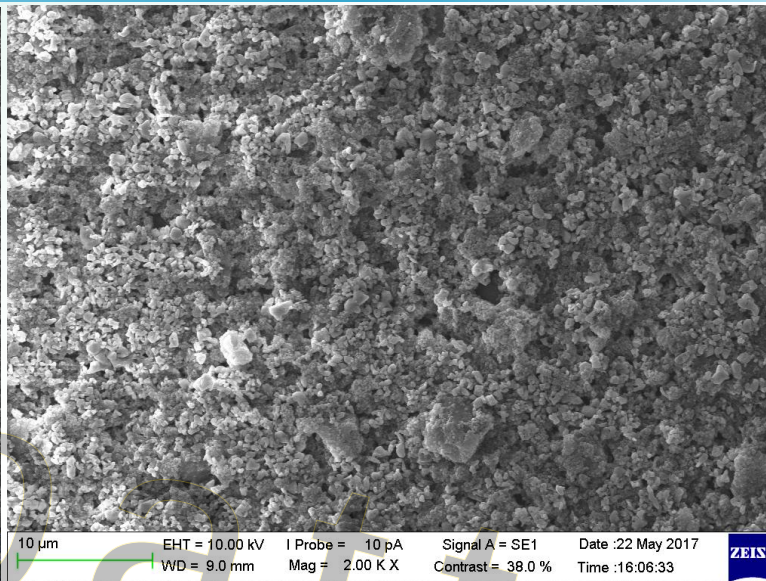
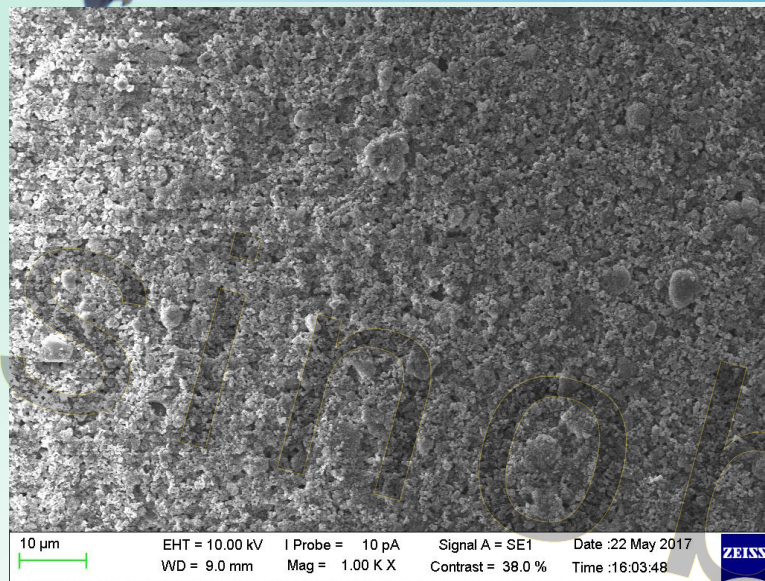
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混合凹版涂布



优点：
成本低；

缺点：
适合于
软包电
芯，隔
膜热收
缩大



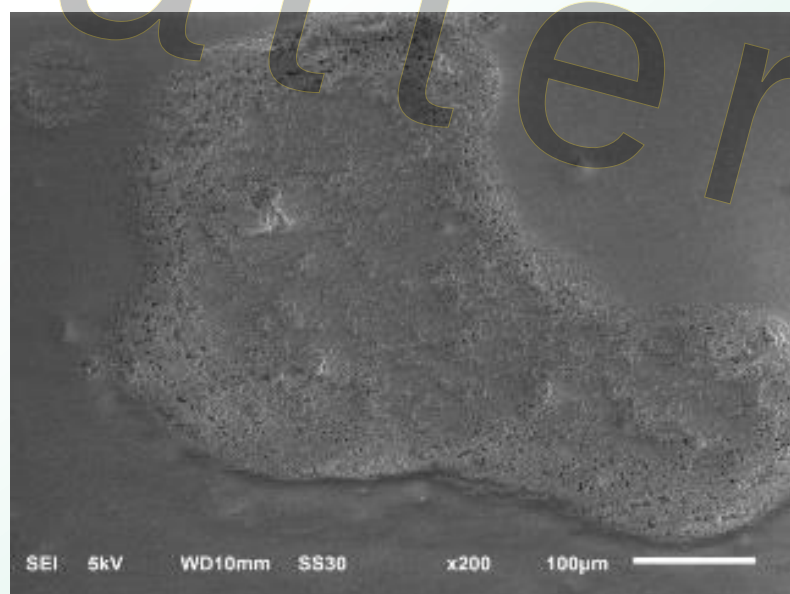
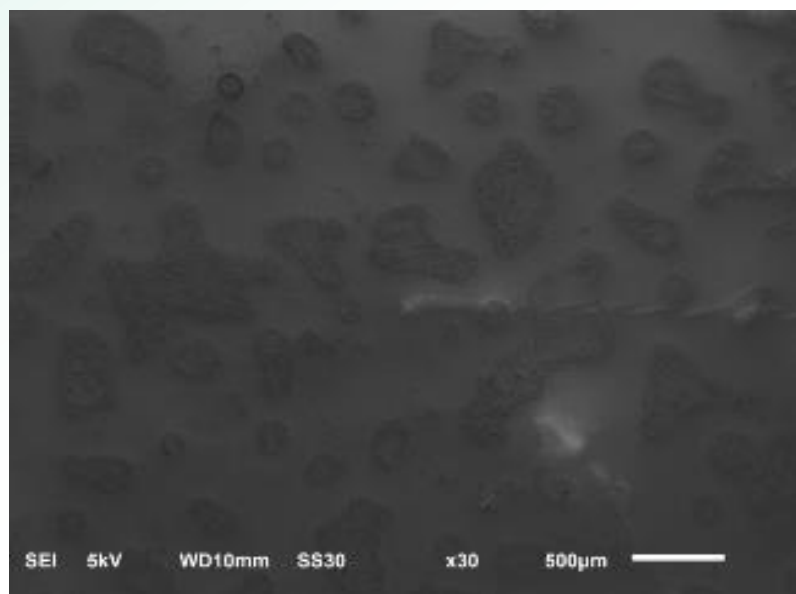
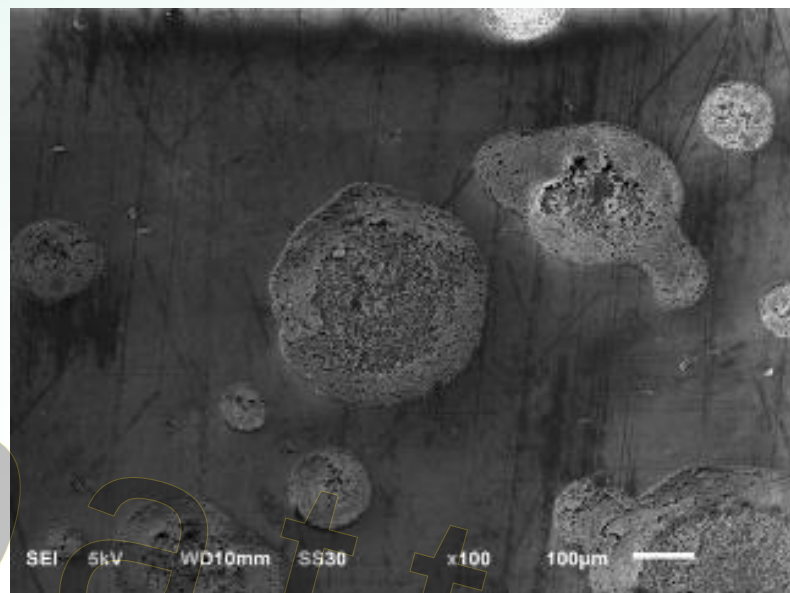
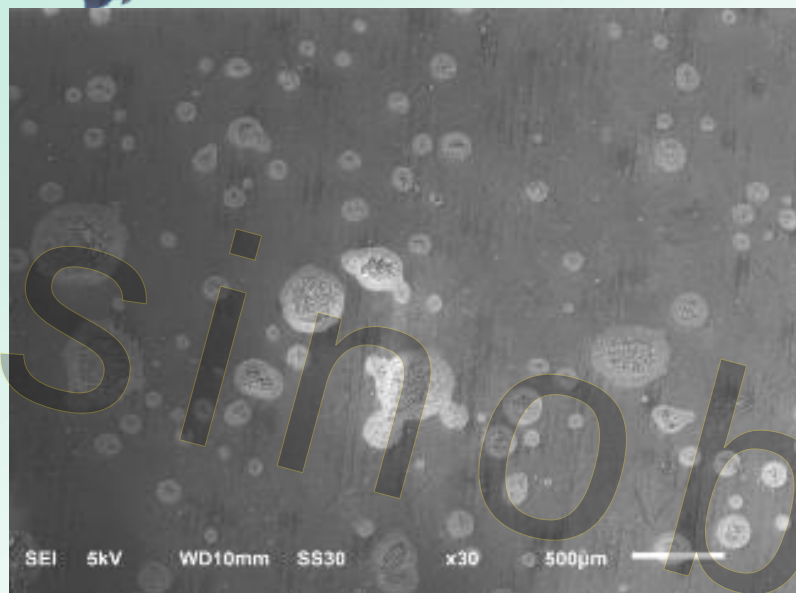
表面凹版涂胶

优点：
和极片
粘结力
高，适
合于软
包及金
属壳方
形电芯；

缺点：
成本高，
内阻增
大



点状喷胶



优点：
不影响
电池内
阻，适
合于软
包及金
属壳方
形电芯；

缺点：
成本高



Performance requirements for adhesive property of separator

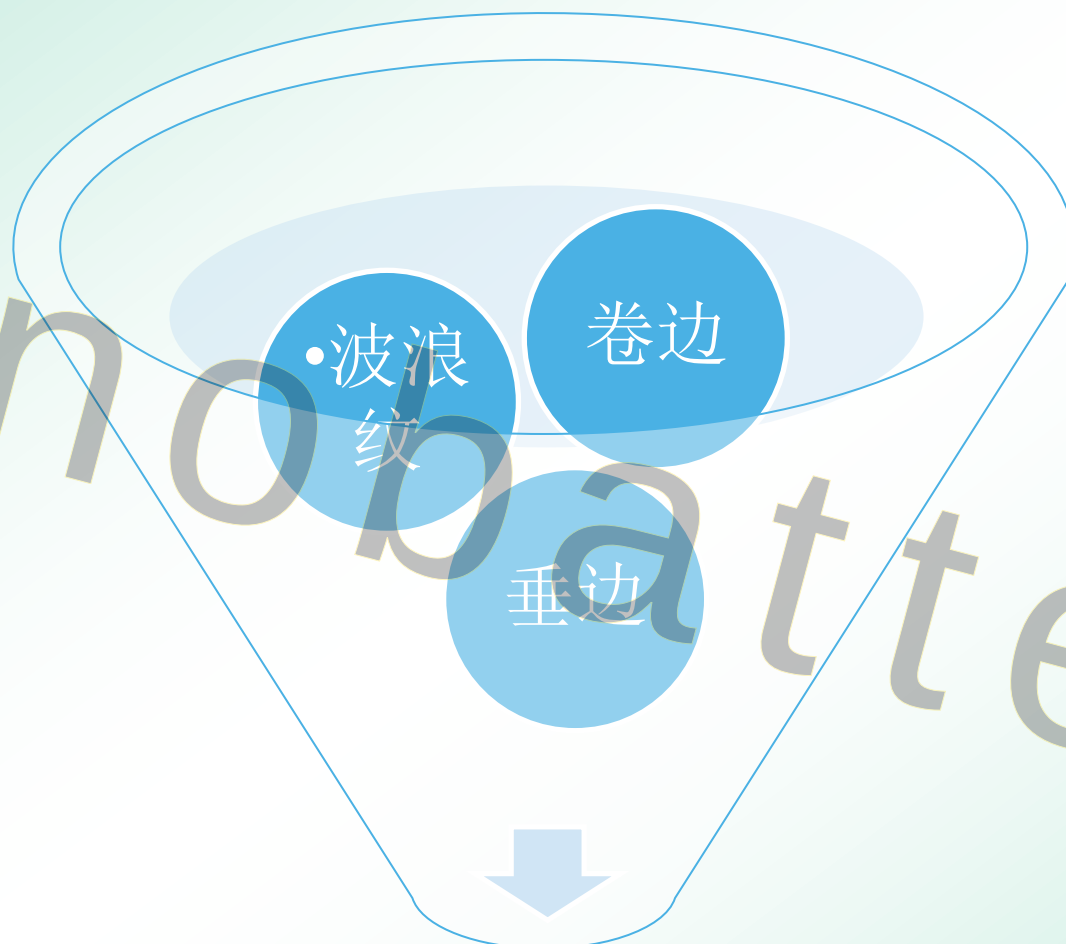
➤ 方形金属壳体电芯：

- (1) 隔膜厚度均值：设计值 $\pm 2\mu\text{m}$
- (2) 透气性：电芯干压（热压或冷压）后，隔膜（基膜为 $9/12\mu\text{m}$ ）透气值 $\leq 300\text{s}$ （ 100cc ）
- (3) 隔膜与正负极极片的附着力： $\geq 5\text{N/m}$
- (4) 冷压实现粘结最佳





Process requirements for surface quality of separator



电芯生产效率和优率显著下降

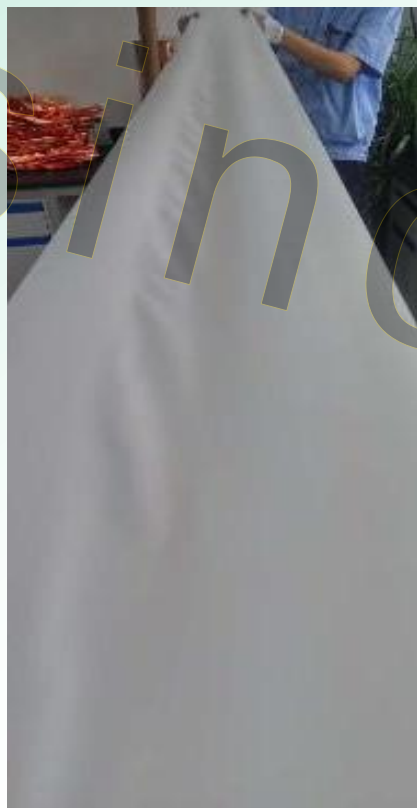


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Process requirements for surface quality of separator

波浪纹—死折

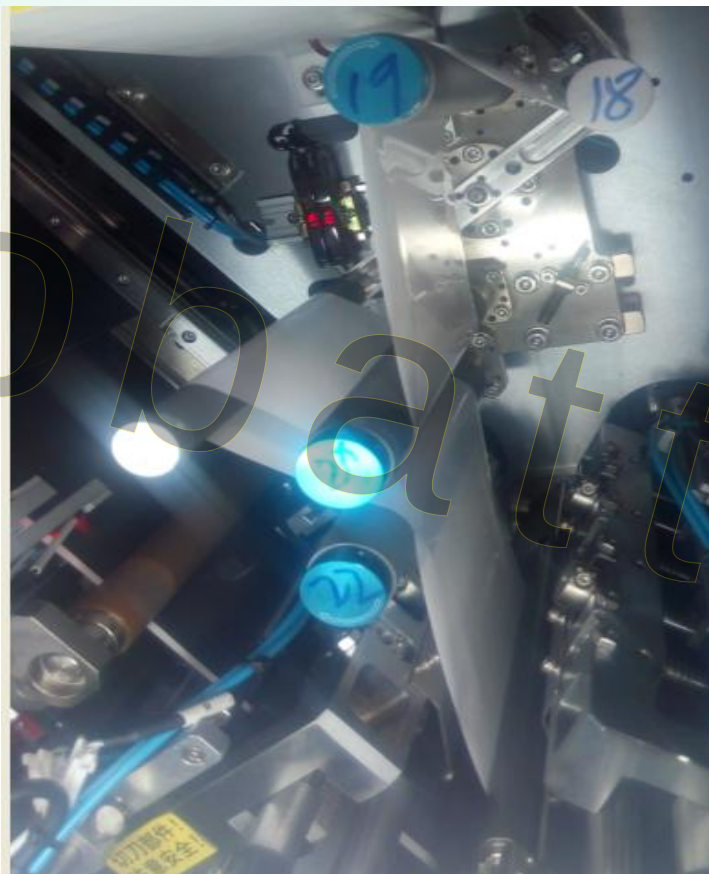


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Process requirements for surface quality of separator

卷边—对齐度不良



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Process requirements for surface quality of separator

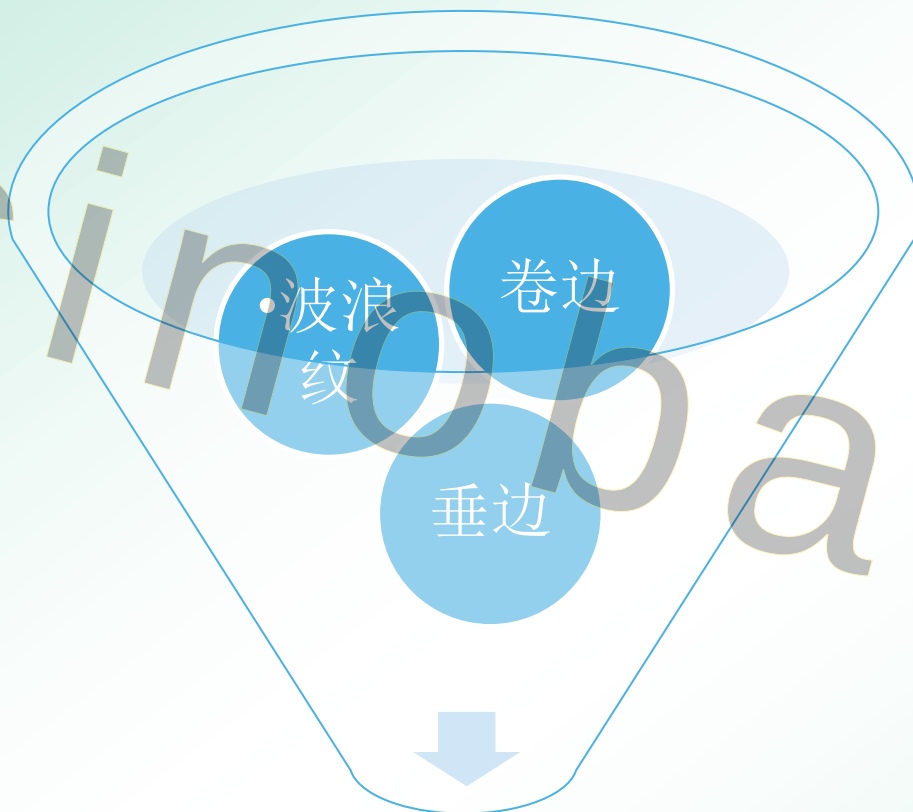
垂边—对齐度不良



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Process requirements for surface quality of separator



电芯生产效率和优率显著下降

隔膜生产企业需要进一步提升、改进生产工艺技术，尽量避免这几种问题的出现



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Process requirements for mechanical strength of separator

过程撕裂

机械强度

短路率高

穿刺强度

注液褶皱

弹性模量?





Process requirements for mechanical strength of separator

	A	B	C
厚度 (μ m)	14+2	14+2	14+2
MD (MPa)	124.1	95.5	108
拉伸强度			
TD (MPa)	12.6	10.8	12.9
穿刺强度 (gf)	292.3	316.7	344.1
工艺性能	良好	卷绕过辊撕裂	良好
短路率 (%)	2.0	0.5	0





Process requirements for mechanical strength of separator

❖ 撕裂



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注液褶皱



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Thanks for your attentions !



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