batteries

MDPI

*Supplementary Material 3 (SM-3)*

# The correlation between electrode length and diameter

*Main article*

# Design, properties, and manufacturing of cylindrical Li-ion battery cells – A generic overview

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| $n_d$ | $n_d^2$ | $d_a$ | $t$ = 200 µm | | | $t$ = 300 µm | | | $t$ = 400 µm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | l | nl | ε | l | nl | ε | l | nl | ε |
| 1 | 1 | 20 | 1508 | 1 | 0,00% | 1005 | 1 | 0,00% | 754 | 1 | 0,00% |
| 2 | 4 | 40 | 6221 | 4,125 | 3,04% | 4147 | 4,126 | 3,16% | 3110 | 4,125 | 3,12% |
| 3 | 9 | 60 | 14075 | 9,334 | 3,57% | 9383 | 9,336 | 3,74% | 7038 | 9,334 | 3,71% |
| 4 | 16 | 80 | 25070 | 16,625 | 3,76% | 16714 | 16,631 | 3,94% | 12536 | 16,626 | 3,91% |
| 5 | 25 | 100 | 39207 | 25,999 | 3,84% | 26139 | 26,009 | 4,04% | 19605 | 26,001 | 4,01% |
| 6 | 36 | 120 | 56486 | 37,458 | 3,89% | 37657 | 37,470 | 4,08% | 28244 | 37,459 | 4,05% |
| 7 | 49 | 140 | 76906 | 50,999 | 3,92% | 51271 | 51,016 | 4,11% | 38454 | 51,000 | 4,08% |
| 8 | 64 | 160 | 100470 | 66,625 | 3,94% | 66979 | 66,646 | 4,13% | 50234 | 66,623 | 4,10% |
| 9 | 81 | 180 | 127170 | 84,330 | 3,95% | 84781 | 84,359 | 4,15% | 63586 | 84,332 | 4,11% |
| 10 | 100 | 200 | 157020 | 104,125 | 3,96% | 104680 | 104,159 | 4,16% | 78509 | 104,123 | 4,12% |

- $n_d$: Scaling factor for the jelly roll diameter
- $d_a$: Jelly roll diameter
- $l$: Electrode length
- $n_l$: Scaling factor for the electrode length
- ε: Relative deviation between $n_l$ and $n_d^2$
- $t$: Composite thickness
  $t = 2 \cdot t_s + 2 \cdot t_c + 2 \cdot t_A + t_{Al} + t_{Cu}$
  $t_s$: Separator thickness
  $t_C$: Cathode coating thickness
  $t_A$: Anode coating thickness
  $t_{Al}$: Aluminum current collector thickness
  $t_C$: Copper current collector thickness