

# Reverse engineering of commercially available lithium ion battery

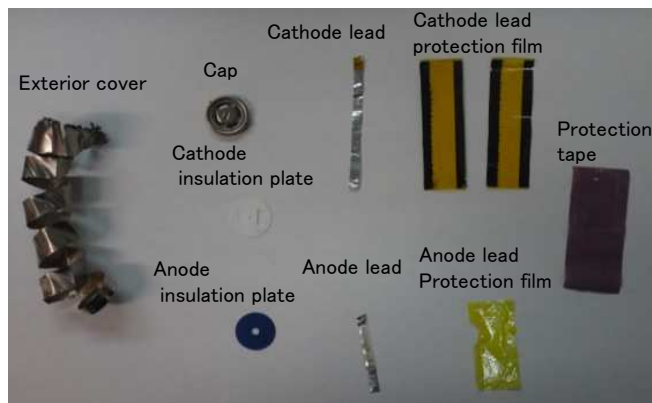
About overseas-made cylindrical lithium-ion battery (18650 type), the case of reverse engineering by dismantling analysis is introduced.

## Mass of each elements

Element	weight (g)	
Total amount of cell	44.65	
Exterior cover	5.76	
Cap	1.82	
Cathode insulation plate	0.041	
Anode insulation plate	0.042	
Cathode lead	0.069	
Cathode lead protection film (two papers)	0.13	
Anode lead	0.098	
Anode lead protection film	0.022	
Protection tape	0.027	
Spirally wound cell	Cathode	19.3
	Anode	13.2
	Separator	0.75
Estimated amount of electrolyte	3.39	

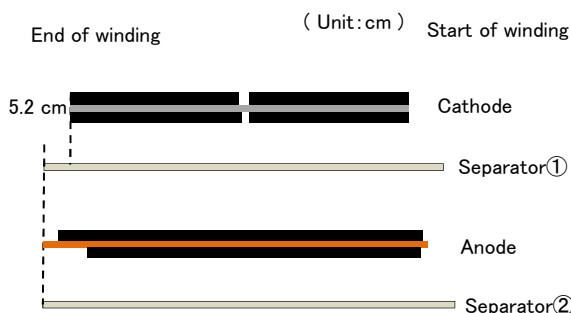


Spirally wound cell



## Electrode and separator arrangement

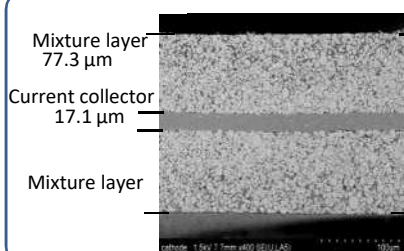
## Electrode/Separator mass, size, weight per unit area



Element	Unit	Cathode	Anode	Separator ①	Separator ②
Full length	(cm)	62.3	70.7	73.4	75.7
Width	(cm)	5.75	5.9	6.0	6.0
Total area(one side)	(cm <sup>2</sup> )	358	417	440	454
Uncoated area (total on both sides)	(cm <sup>2</sup> )	12.1	78.5	—	—
Weight per unit area (total on both sides)	(mg/cm <sup>2</sup> )	50.2	25.3	—	—
Mass per unit area	(mg/cm <sup>2</sup> )	—	—	0.85	0.85
Mixture layer thickness	(μm)	155	152	—	—
Mixture density	(g/cm <sup>3</sup> )	3.25	1.66	—	—
Mixture weight	(g)	17.7	9.5	—	—
Current collector weight	(g)	1.6	3.7	—	—
Overall weight	(g)	19.3	13.2	0.37	0.38

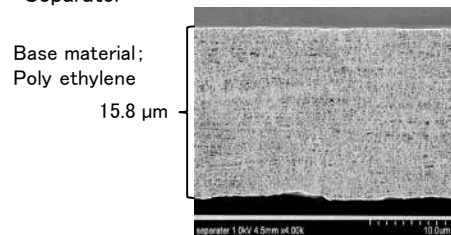
## Composition of main components

### Cathode

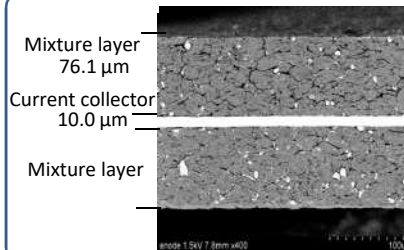


Item	Component	Content (mass%)
Active material	Li(Ni <sub>0.7</sub> Co <sub>0.15</sub> Mn <sub>0.15</sub> )O <sub>2</sub>	93
Binder	PVDF	3.0
Conductive material	Low crystalline carbon	4.0

### Separator



### Anode



Item	Component	Content (mass%)
Active material	Graphite(C)	96
	Low crystalline carbon (Estimated as conductive material)	
	SiO	3.0
Binder	SBR	1.0

### Electrolyte solution

Classification	Component name	mass%
Solvent	Dimethyl carbonate	47*
	Propylene carbonate	5.0
	Ethylene carbonate	30
Electrolyte	LiPF <sub>6</sub>	18

\*:Correction value