

SPIR-A-FLOW

湿法包覆机



研发
R&D



生产
Production



销售
Sales



售后
After sales



设备名：湿法包覆造粒机

用途：原材料的混合・造粒・干燥・包覆

Equipment name : Wet coating granulator

Use : Mixing, granulation, drying, coating of raw materials

【应用领域】

化学品：锂电正负极材料 磁性粉 陶瓷 颜料 触媒等

食品：糖 咖啡 可可粉 氨基酸盐 调料 香料等

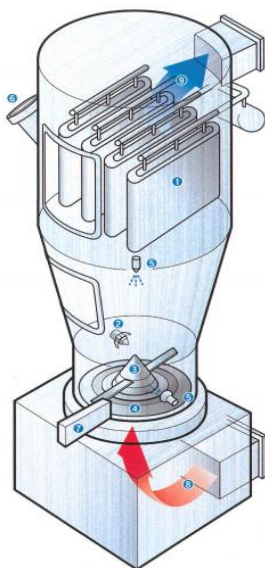
医药品：调制用细粉 药剂颗粒 胶囊颗粒 覆色等

【Application】

Chemicals : Battery cathode and anode material Magnetic powder Ceramics Pigments Catalysts etc.

Food : Sugar Coffee Cocoa powder Amino acid salt Seasoning Spices etc.

Pharmaceuticals : Fine powder Pharmaceutical granules Capsule granules Coloring etc.



混合造粒包覆干燥原理

- ①热风从机器下方进入
- ②热风从旋转部的外围进入
- ③热风从旋转部分的网进入
- ④自动投料
- ⑤圆盘离心滚动形成致密颗粒
- ⑥搅拌叶片的旋转产生涡流
- ⑦两种热风作用形成低密度的软颗粒
- ⑧用破碎刀片破碎和分散粗颗粒
- ⑨直接从底部喷雾器喷出液体
- ⑩上部喷雾器喷出液体进行凝胶造粒
- ⑪液体喷涂可以是连续或间歇喷涂
- ⑫液体喷涂停止后粉末开始干燥
- ⑬产品自动卸料
- ⑭空气通过袋式过滤器排出

Mixed granulation coating drying principle

- ① Hot air enters from under the machine
- ② Hot air enters from the periphery of the rotating part
- ③ Hot air enters from the net of the rotating part
- ④ Automatic feeding
- ⑤ The disc is centrifuged and rolled to form dense particles
- ⑥ The rotation of the stirring blade generates vortex
- ⑦ Two kinds of hot air action to form low-density soft particles
- ⑧ Crush and disperse coarse particles with a crushing blade
- ⑨ Spray liquid directly from the bottom sprayer
- ⑩ The upper sprayer sprays out liquid for coagulation and granulation
- ⑪ Liquid spraying can be continuous or intermittent spraying
- ⑫ The powder begins to dry after the liquid spraying stops
- ⑬ Automatic product discharge
- ⑭ The air is discharged through the bag filter

旋转部分的4个要素

4 elements of the rotation section

离心旋转

旋转转子的旋转产生具有高堆积密度的球形颗粒。也可以进行具有尖锐粒度分布的制粒。

Centrifugal rotation

The rotation of the rotating rotor produces high stacking spherical particles of density. It is also possible to have sharp particle size distribution granulation.

浮流动态

热风从旋转部的外周和旋转部分的网进入。两种空气流产生具有低堆积密度的软颗粒。

Float dynamics

Hot air enters from the outer periphery of the rotating part and the net of the rotating part. Both air streams produce soft particles with low bulk density

转盘和搅拌桨叶在单独的电动机和轴上旋转。

在最佳条件下以可变速运行。

空气量分别针对流体空气和狭缝空气进行调节。

这是搅拌・滚动・流动的复合化！

The turntable and stirring blades rotate on separate motors and shafts.

Operates at variable speed under optimal conditions.

The air volume is adjusted separately for fluid air and slit air.

This is a combination of stirring, rolling, and flowing!



旋转流动态

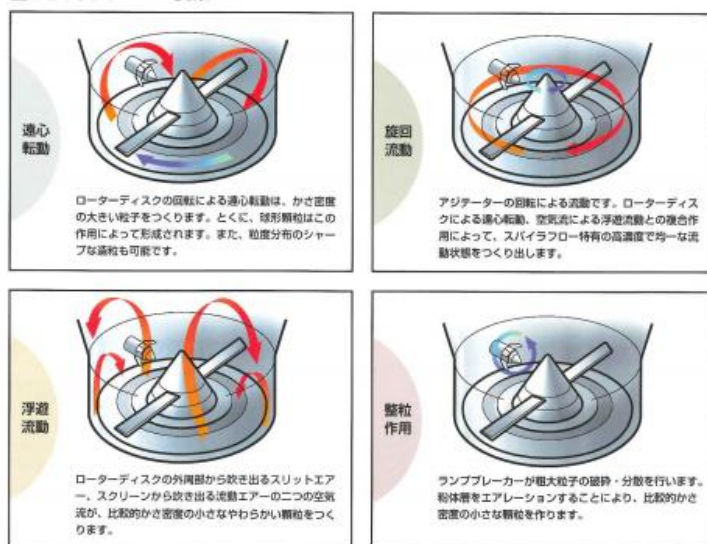
离心旋转和浮流动态气流及搅拌器旋转的共同作用。

产生了高浓度和均匀的流动状态。

Rotary flow dynamics

Centrifugal rotation and floating dynamic airflow and agitator the combined effect of rotation.

Produces high concentrations and uniform flow state.



整粒作用

破碎机破碎并分散粗颗粒。

将空气搅拌施加到粉体层上以形成具有低堆积密度的颗粒。

Whole grain action

The crusher crushes and disperses the coarse particles.

Air agitation is applied to the powder layer to form particles with a low bulk density.

设备类型 Equipment type



SFC-LABO



SFC-10



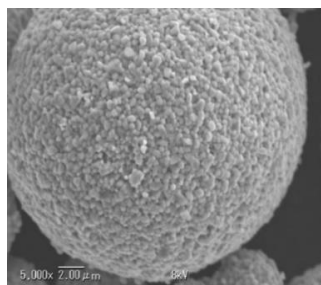
SFC-150



SFC-300

型号 Model	SFC-LABO	SFC-MINI	SFC-3	SFC-5	SFC-10	SFC-15	SFC-30	SFC-50	SFC-100	SFC-150	SFC-200	SFC-300
原料投入量 Material input quantity	1g	2g	12g	20g	40g	60g	120g	200g	400g	600g	800g	1,200g
旋转圆盘电动机 Rotating disc motor	0.1kW	0.09kW	0.2kW	0.4kW	0.75kW	0.75kW	1.5kW	2.2kW	2.2kW	3.7kW	5.5kW	7.5kW
搅拌桨叶电动机 Stirring blade motor	--	0.2kW	0.75kW	0.75kW	1.5kW	1.5kW	3.7kW	5.5kW	5.5kW	7.5kW	7.5kW	11kW
破碎刀片电动机 Crushing blade motor	--	0.15kW	0.1kW	0.4kW	0.4kW	0.75kW	0.75kW	1.5kW	2.2kW	3.7kW	3.7kW	5.5kW
机器宽度 W mm	800	1,200	1,600	800	900	900	1,300	1,500	1,800	1,900	2,000	2,200
机器长度 D mm	700	800	800	1,000	1,200	1,200	1,300	1,300	1,500	1,600	1,700	1,900
机器高度 H mm	1,200	1,600	2,000	2,600	2,900	2,900	4,000	4,000	4,400	4,600	4,700	4,900

设备优势 Advantage of equipment



可以完成100%的包覆哦!
100% coating can be completed!



原料的混合·造粒·干燥·包覆! 用1台设备可完成连续处理!

腔体底部装有可变频调节刀盘、搅拌桨叶的综合搅拌层型造粒包覆机。

混合、造粒、干燥、包覆等复杂工艺结合在一体的设备。

颗粒间无2次团聚,且具有大颗粒与小颗粒极高均匀性的包覆性能。

由腔体侧面的喷淋头喷雾方式实现粒子表面的高附着率的包覆工艺。

利用离心转动、浮游流动、旋回流动的一体化自由精密的把控颗粒形状、粒度分布、容积密度等自由精密的控制造粒工艺。

可使用自动清洗功能,简便轻易地清洗设备。

Mixing, granulation, drying and coating of raw materials! Continuous processing can be completed with 1 device!

The bottom of the cavity is equipped with a variable frequency adjustment cutterhead and a comprehensive stirring layer type granulation coating machine for stirring impellers.

Mixing, granulation, drying, coating and other complex processes are combined in one equipment. There is no two agglomerations between particles, and it has a coating performance with extremely high uniformity between large particles and small particles.

The spray on the side of the cavity realizes a coating process with a high adhesion rate to the particle surface. Using the integration of centrifugal rotation, floating flow, and rotary flow, the particle shape is controlled freely and precisely.

Free and precise control of granulation processes such as particle size distribution and bulk density.

The automatic cleaning function can be used to clean the equipment easily.

行业其他造粒设备的对比

Comparison of other granulation equipment in the industry

造粒机名称 Granulator Name	流动层造粒机 Flowing layer Pelletizer	滚子造粒机 Roller Pelletizer	搅拌造粒机 Agitator Pelletizer	SFC SFC
造粒品形状 Pelletizing product shape	不定形 Amorphous	真正球 True ball	不定形 Amorphous	不定形可 球形可 Amorphous can Spherical can
嵩密度 Song density	轻 Light	中 Medium	重 Heavy	轻中重可 Light Medium Heavy Available
混合度 Effect of mixing	微粒的分离 Separation of fine particles	混合不良 Poor mixing	均一 Uniformity	均一 Uniformity
粒度分布 Particle size distribution	如果条件一致可 If the conditions are consistent can	尖的狭窄 Pointed narrow	广泛 Extensive	尖的狭窄 Pointed narrow
造粒时间 Granulation time	中 Medium	长 Long	短 Short	短 Short
乾燥機能 Drying function	有 Yes	无 No	无 No	有 Yes



转盘和搅拌桨叶要素 Rotor disk and Agitator element

采用2轴方式

2-axis approach



2轴系统使得转子和搅拌叶片可以相反方向旋转。
强大的剪切作用减少了对设备内壁表面的附着力
减少颗粒之间的聚集等！

The 2-axis system allows the rotor and mixing blades to rotate in opposite directions.

Strong shear action reduces adhesion to the inner wall surface of the device.

Reduce aggregation between particles, etc.!



No.1 标准规格 造粒 包覆

No.2 小型机用 造粒 包覆

No.3 强力搅拌和混合用

No.4 细粉修饰造粒用

No.5 细粉修饰造粒用强搅拌型

No.6 细粉修饰造粒用搅拌叶型

No.7 细粉修饰造粒变形型

No.1 Standard specification granulation coating

No.2 Granulation coating for mini machines

No.3 For strong stirring and mixing

No.4 Fine powder for modification and granulation

No.5 Strong stirring type for fine powder modification granulation

No.6 Fine powder modification of mixing blade type for granulation

No.7 Fine powder modified granulation deformation type



新开发技术 Newly developed technologies

粒子测定装置

通过实时图像分析

实现颗粒形成过程的完全管理

取样调查形成颗粒中的粒子

实时测量粒子直径

平均粒度·粒度分布·细粉末含量

粗大粉末含量·球形度

等可生产中确认

在显示屏上直观表示推移图表

电脑内藏数据登记·记录·打印

也可控制最终的形成颗粒度

Particle measuring device

Through real-time image analysis

Enables complete management of the particle formation process

Sampling investigates the particles in the formed particles

Measure particle diameters in real time

Average particle size, particle size distribution, fine powder content

The amount of coarse powder and sphericity can be confirmed during production

Visually represent the scrubbing chart on the display

Computer-embedded data registration, Record, Printable

The final formation particle size can also be controlled

新技术!
New technology!



用红外线湿度计控制干燥

用非接触法测量水分

利用红外线照射原料

从波长光即可测出水分

及流动层内部的粉粒体水分量

非接触·实时地连续测量

也可用在在防爆区域的测量

喷雾器的速率控制

形成颗粒及干燥完成点的控制

The formed particles are dried after being dried with an infrared hygrometer

Moisture is measured by the non-contact method

Irradiate raw materials using infrared light

Moisture can be measured from wavelength light

and the amount of powder and granule moisture inside the flow layer

Non-contact, real-time continuous measurement

It can also be used for measurement in explosion-proof area

Rate control of the sprayer

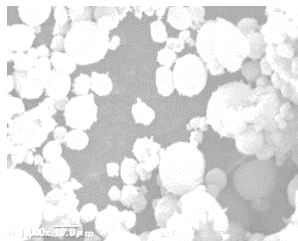


试验案例 Experimental cases

NCA+Al(OH)₃ (0.3wt%)湿法包覆试验 NCA+Al(OH)₃ (0.3wt%) wet coating test

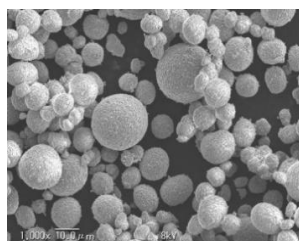
正极材料包覆SEM效果分析

Analysis of SEM effect of cathode material coating



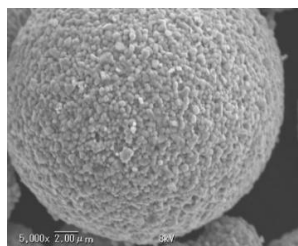
包覆前NCA×1000倍

NCA×1000times before coating



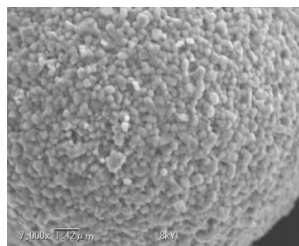
包覆后NCA×1000倍

NCA×1000times after coating



包覆后NCA×5000倍

NCA×5000times after coating



包覆后NCA×7000倍

NCA×7000times after coating

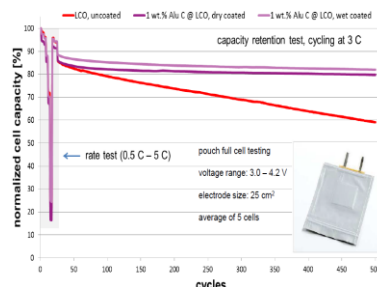
经过包覆工艺防止粒子表面裂纹!
Coating process to prevent particle surface cracks!

课题: (1) 电解液的分解
(2) 正极活粒子内部的クラックの発生



電池性能の低下

解決策: 気相法アルミナを保護層として表面にコーティング

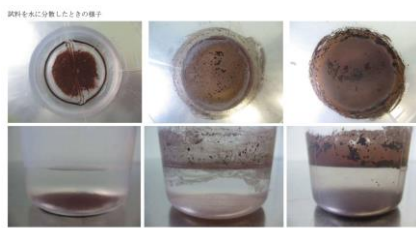


提高电池性能!
Improve battery performance!



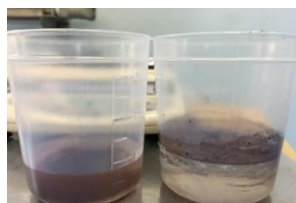
试验案例 Experimental cases

碳氢化合物(沥青)包覆 二氧化硅试验! Hydrocarbon coating Silica SiO₂ test!

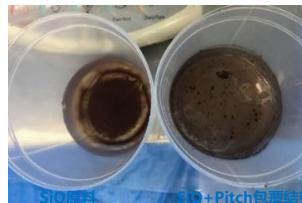


氧化硅通常沉淀于水中
经沥青包覆后浮在水面!

Silica is usually precipitated in water
Asphalt-coated and floats on the surface!



SiO raw materials SiO+Pitch coating ends



SiO raw materials SiO+Pitch coating ends

负极材料包覆亲水性测试效果分析

SiO + Pitch Wet Coating

Anode material coating hydrophilic test



湿法包覆试验 二氧化硅SiO₂ + 石墨Carbon Wet coating test Silica SiO₂ + graphite carbon

试验	方式	基础材	添加量	石墨泥浆	添加量	溶媒	备注
1	湿法	SiO	750g	泥浆A	863g	水	纤维质石墨
2	湿法	SiO	750g	泥浆A	431g	水	纤维质石墨 石墨量减半
3	湿法	SiO	750g	泥浆B	877g	水	纤维质石墨 加入1%的粘合剂A
4	湿法	SiO	750g	泥浆C	1,443g	水	纤维质石墨 加入1%的粘合剂B
5	湿法	SiO	750g	泥浆D	277g	NMP	球状石墨
6	湿法	SiO	750g	泥浆D	138g	NMP	球状石墨 石墨量减半
7	湿法	SiO	750g	泥浆E	427g	NMP	球状石墨 加入1%的粘合剂C
8	湿法	SiO	600g	泥浆D	222g	NMP	
9	湿法	SiO	300g	泥浆A	345g	水	试验8后由于干燥膨胀SiO减半
10	湿法	SiO	300g	泥浆C	577g	水	试验8后由于干燥膨胀SiO减半



湿法包覆实验机

Wet coating experimental machine



高新技术企业
High-tech enterprise



高新技术产品认定
High-tech product identification



中国科学院苏州纳米研究所产学研基地
Suzhou Institute of Nanotechnology, Chinese Academy of Sciences, Designation of Joint Research Centers



中南大学合作设立博士生工作站
Collaboration with Central South University to establish a doctoral internship



ISO9001认证
ISO9001 certification



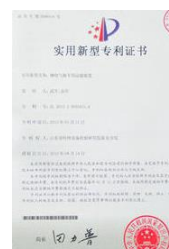
欧洲CE认证
CE certification in Europe



韩国KCs认证
KCs certification in Korea



防爆设备安装认证
Explosion-proof equipment installation certification



专利证书
Patent certificate

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锂电设备 粉体机器

