AGIRENT

安捷睿

Smart-Painting

new material-AI

robotization

Enterprise Profile

AGIRENT 安捷睿

- National High-Tech Enterprise
- Fujian Province Science and Technology Small Giant Enterprise
- Xiamen Specialized, Sophisticated, and Innovative Small and Medium-Sized Enterprises
- Gazelle Enterprises in FujianProvince
- Xiamen Torch Gazelle Enterprises
- ISO Quality System Certification
- Xiamen High-Tech Enterprise
- Xiamen Future Industry Backbone Enterprises
- Technology-Based Small and Medium-Sized Enterprises

essential information

2015 Xiamen, Fujian 40+ 60+

Established date, Company address, R&D personnel, Intellectual property

main business

Intelligent Coating

Intelligent Equipment Laboratory/Production Line

Formula Validation

New Material AI

Unmanned laboratory

quality inspection

expert system

Robotization

Robotapplications

automation equipment

machine vision

external cooperation

清華大學 Tsinghua University

哈爾濱工業大學 HARBIN INSTITUTE OF TECHNOLOGY

中國科學院 CHINESE ACADEMY OF SCIENCES

DÜRR

sames

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Smart Painting

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Rotary Table Reciprocating Machine

Patent Product/First in China

Electrostatic Spin Cup/Automatic Spray Gun Water-based/Solvent Universal Explosion-proof Certification

Quick Change Painting Robot

Patent product

Most belong to fast switching system with internal andexternal power supply and multi-process switching

Spray Gun Reciprocating Machine

Patent product

Explosion-proof certification

Automatic/manual spray gun

Painting Laboratory/Production Line

IntelligentPaintingLaboratory Engineering, Painting

Process Upgrade

Special Painting Production Line Engineering

Intelligent Painting Strategic Partner

Smart-Painting

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Chinese mainland general industrial strategic partners

DURR & SAMES Official Integrator

Main Business-Intelligent Painting

Patent

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Rotary Table ReciprocatingMachine

- Patent Products & First-of-a-Kind Catalog Products

- **First domestic** electrostatic high-voltage high-speed spraying reciprocating equipment
- **Suitable for both water and oil,** meeting the requirements of multiple processes
- online switching of internal and external power supply
- Unique paint supply system with precise control, low consumption, and automatic cleaning
- The parameter is open, supporting development and testing of all types of industrial coatings
- Compatible with mainstream brand atomizers and auto-sprayers
- Integrates **two sets of atomizers and one set of spray guns**
- EU explosion-proof system certification

Main Business-Intelligent Painting

Quick Change Painting Robot

- **patent product**

- **Multi-actuator Quick-change System** compatible with mainstr- eam brand atomizers and auto-sprayers, with a dynamically expandable actuator library

- **Robotic Control for Simulation of Any Spray Trajectory**

- **Water-oil dual-mode operation with online switching between internal and external power supply**

- Exclusive paint supply system with precise control, low consumption, and automatic cleaning;

- The parameter is open, supporting development and testing of all types of industrial coatings.

- Modular interface (program, parameters, color change, cleaning, etc.);

- Easy to operate, low operation and maintenance cost;

Main Business-Intelligent Painting

Spray Gun Reciprocating Machine

- Patent product.

- High-precision two-axis reciprocating motion with optional third-axis configuration.

- Compatible with mainstream brands **auto/manual spray gun**;

- Supports multiple processes with versatile functionality, reducing capital investment.

- Modular interface (program, parameters, color change, cleaning, etc.)

- It is suitable for the development of many kinds of coating process and defect simulation.

- Applicable to R&D and production environments;

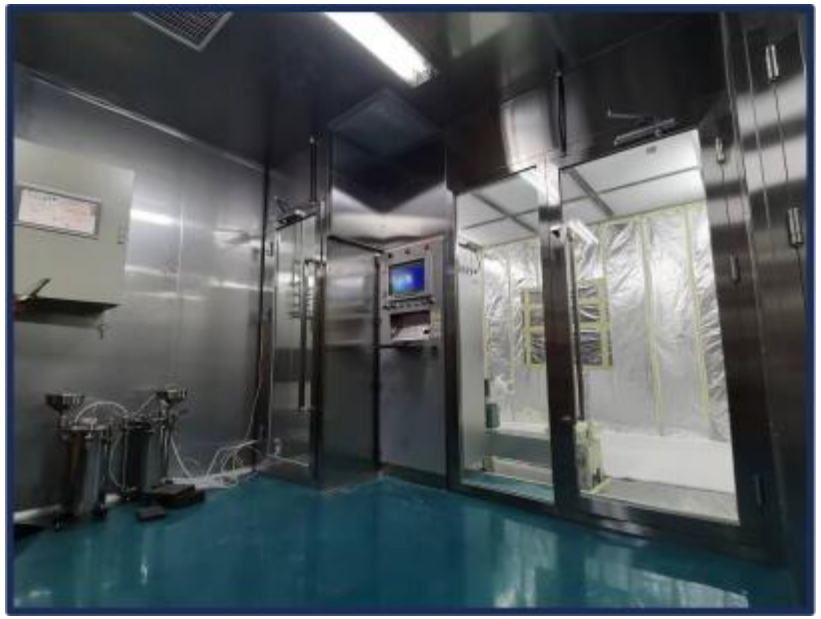
- It is stable, reliable, easy to operate and low in operation and maintenance cost.

Main Business-Intelligent Painting

Painting Laboratory/Production Line

- Overall Construction of Painting Laboratory

- intelligent painting equipment
- Automatic Sprinkler Room and Fresh Air Air Conditioning System
- Laboratory furniture

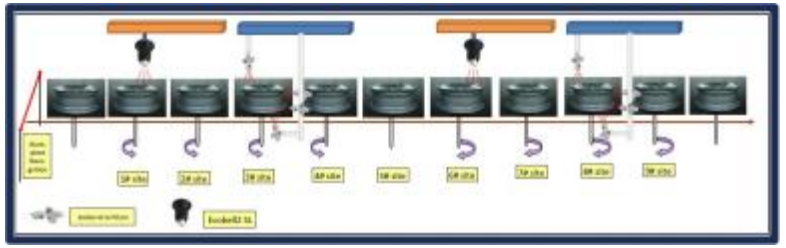


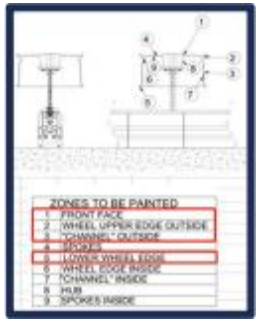
- Painting production line

- general industrial painting equipment
- General Industrial Painting Production Line R & D Design, Installation, Adjustment and Maintenance
- Optimization Design and Test Verification of General Industrial Coating Process

typical case:

wheel hub painting line





The spray system of two-coat-one-bake color paint, varnish and one-coat-one-bake transparent varnish spray room is introduced.

AI-Based Intelligent Painting Platform for Automotive Aftermarket-AI Intelligent Painting

[ModelRecognition]
[posturerecognition]
[Requirement Det-ermination]
[Generate Plan]

decision side

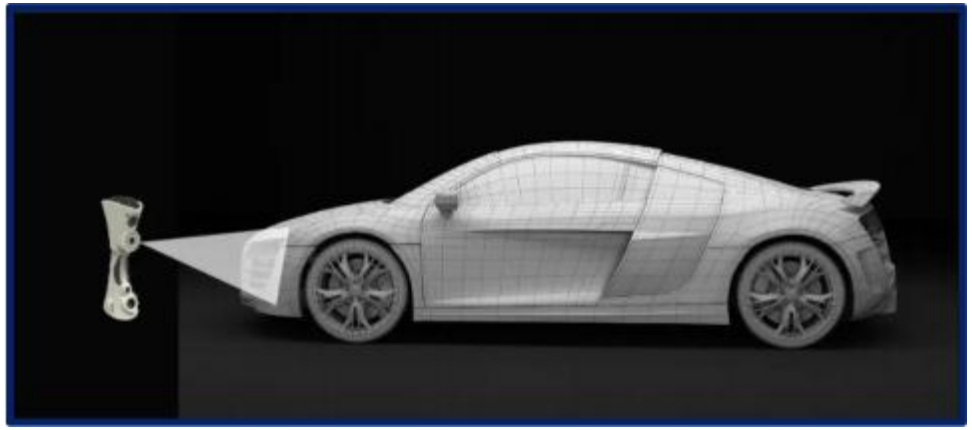
[Model Data]
[coating formula]
[Painting Process]
[enviromental pa- rameter]

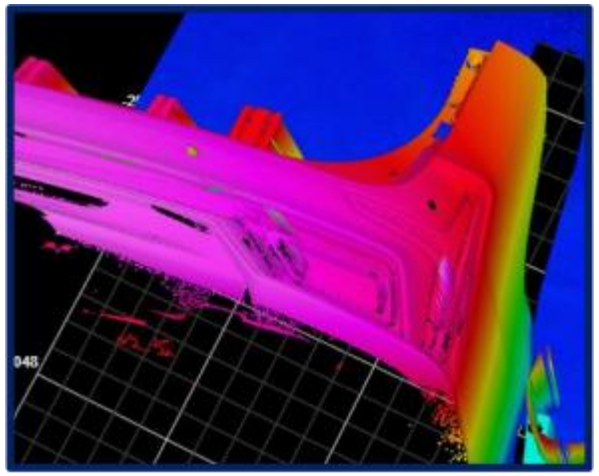
[3D machine vision]→[AI decision system]→[cloud data center]→[intelligent paint supply system]→[intelligent spraying system]

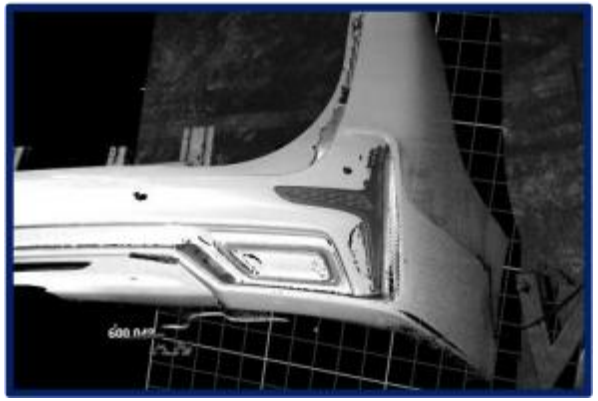
Perceptual end

Executive end

Cloud Data Center-Vehicle Database







Vehicle Data

Build a **vehicle model data center,**which is equipped with 3D scanning module and related data processing unit. The center completes the 3D contour scanning of the required vehicle and establishes the relevant **vehicle model data file.**

Trajectory Generation

Using AI algorithms, the system matches vehicle models and postures with information uploaded from execution terminals,**plans spray trajectories,**and then distributes them to each terminal through cloud data sharing. By simply configuring **vehicle positioning and recognition modules,**execution terminals can complete full-body painting or body repair for various vehicle types.

Replace manual spraying with automated systems to boost efficiency and ensure consistent results.

Cloud Data Center-Paint Database

Formula Data

Set up a **paint data center,**test new coatings and new processes through the intelligent coating R & D system of the center until the required process parameters are achieved, and establish the relevant **paint formulation and process files.**

Precision Paint Adjustment

Through AI algorithm, the system matches vehicle models and color requirements with information uploaded by execution terminals, **plans coating formulations and implementation processes,**and then shares cloud data to various execution terminals. Execution terminals only need to configure **paint supply systems and related coating actuator libraries,**and complete vehicle-wide spraying or body repair for various coatings and processes.

Replace manual paint mixing with automated testing spray to enhance new paint application efficiency. Each repair color adjustment maintains perfect color consistency

Main Business-Intelligent Painting

Key Customers

PPG We protect and beautify the world™

AXALTA

立邦

allnex The Coating Resins Company

WANHUA

KINLITA ENTERPRISE 金力泰

Huatu Chemical 华深化工

SOKAN

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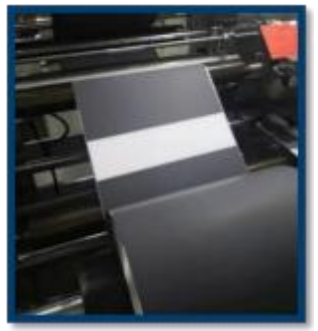
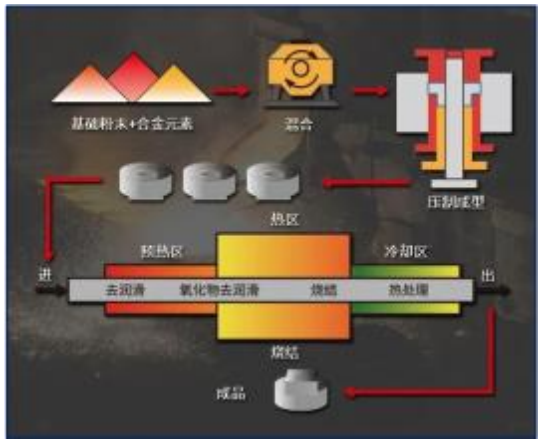
Formulation Development

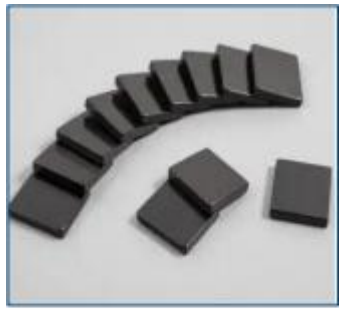
Process Product Inspection

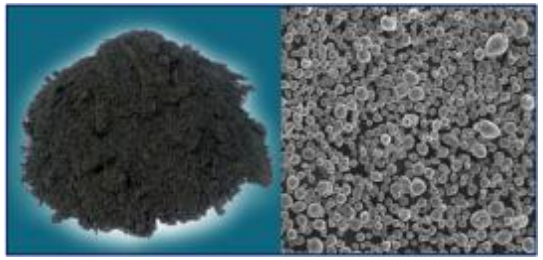


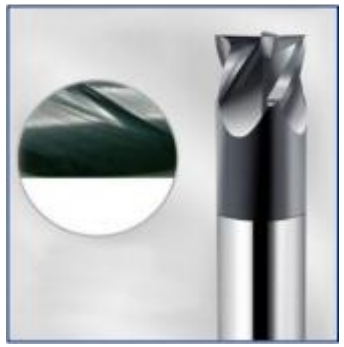
Surface Preparation

Finished Product Testing





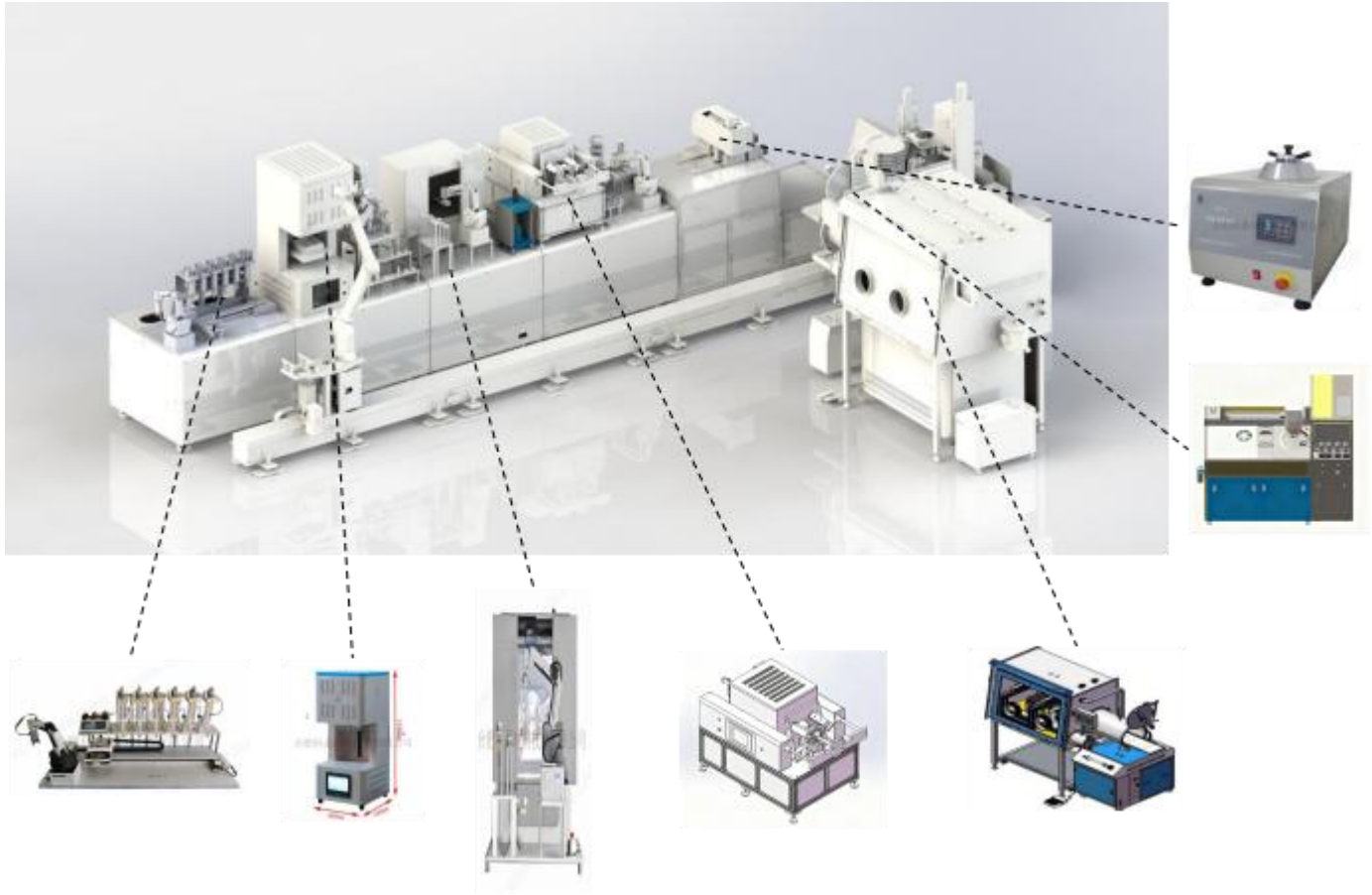




Intelligent New Material R&D System

- automated integration technology
- Machine Vision Techno- logy RobotTechnology
- High throughput: Both batching and sintering support ≥4-channel syn- chronization, with effic- iency several times higher than traditional methods.

Robot + AGV + Visual Align- ment



Systems Definition

Consisting of an automated dosing system, autom- ated molding unit, and high-throughput detection equipment, it generates precise experimental data for optimization of formulations using large-scale material models. Continuous iteration is performed until the experimental objectives are achieved.

Customer Value

Significantly enhances experimental effi- ciency, enabling 'single-batch experiments with multi- variable validation' to rapidly accumulate valid data.

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-Chief Scientist of Agilent Robotics

-Liu Xingjun, Professor and Doctoral Supervisor at Harbin Institute of Technology (Shenzhen)

Director of the Institute of Material Genomics and Big Data

Xiamen University Lecture Professor

Recipient of the National Science Fund for Distinguished Young Scholars

National Leading Talent in Shenzhen

Foreign Member of the Russian Academy of Natural Sciences

Liu Xingjun

Director of the Institute of Materials Genomics and Big Data at Harbin Institute of Technology

Recipient of the National Science Fund for Distinguished Young Scholars, Foreign Academician of the Russian Academy of Natural Sciences

achievements in scientific research:

- General Program of National Natural Science Foundation of China-Accelerated Design and Properties of γ,-Phase Reinforced High Entropy High Temperature Alloys Based on Machine Learning and Phase Diagram Coupling Method
- Research and Application of Vehicle High Voltage Direct Current Relay
- Shenzhen Science and Technology Program Project-Optimization Design and High Temperature Engineering Application of Nanoparticle Enhanced Heterogeneous High Entropy Alloy Based on Machine Learning and Additive Manufacturing
- Key Project of Guangdong Provincial Basic and Applied Basic Research Fund Regional Joint Fund-Research on Constitutive Forming and 3D Printing Special Processing Technology and Properties of Key Structural Materials
- Key Project of National Key R&D Program-Research on Key Technologies for the Construction of National New Material Database Platform
- Fundamental and Applied Basic Research in Guangdong Province-Major Project: Manufacturing Principles and Performance Control Theory of Magnesium/Heterometallurgical Composites
- Design, Structure Control and Mechanical Properties of Nano-Silicide G-Phase Reinforced High Entropy Alloy

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-Agilent Robotics Senior Consultant, Materials Science

-Professor Zhuang Zhigang, Senior Engineer

-State Council "Special Government Allowance" experts

-Chairman of the China Tungsten Association Executive Committee
President of Xiamen High-Tech Association

President of the Xiamen New Materials Association

Mr.Zhuang Zhigang has made outstanding achievements in tungsten materials and related fields. As a core technology leader and enterprise leader, he has led Xiamen Tungsten Co., Ltd. and its key subsidiary, Xiamen Honglu Tungsten and Molybdenum Industry Co., Ltd., making significant contributions to the research and industrialization of tungsten wire materials, corporate strategic innovation, and talent cultivation.

Major achievements in the field of materials:

-Led the R&D of "single-wire tungsten filaments weighing 3-5kg and 8-12kg thick wires," overcoming a series of technical challenges including tungsten doping, powder preparation, vertical melting, welding, and pressure processing. Independently developed key production equipment (e.g., vertical melting machines, reduction furnaces). This breakthrough ended foreign monopolies on high-performance tungsten wire manufacturing, filled domestic gaps, and transformed China's tungsten industry from import dependence to large-scale exports.

To overcome foreign technological blockades and prohibitively high equipment costs, the company pioneered a "patchwork model" for production line construction. This approach involved selectively importing critical equipment from various countries while integrating it with self-developed technologies. Through digestion, absorption, and re-innovation, the company achieved domestic production of core equipment (reducing costs to one-tenth or even less of imports) and broke through the technical bottleneck in precision mold manufacturing. The production line now boasts over 90% domestic production, significantly cutting costs, eliminating dependence on foreign equipment and technologies, and establishing proprietary core technologies.

ZhuangZhigang

Professor-level Senior Engineer, expert with the "Special Government Allowance" from the State Council, Chairman of the China Tungsten Association Executive Committee President of Xiamen New Materials Association and President of Xiamen High-Tech Association

- **Agilent Robotics Senior AI Technology Advisor**

- **PhD in Electrical and Computer Engineering, Technical University of Munich (**Image and video processing, artificial intelligence)

- **Academic leader of Haixi Research Institute of Chinese Academy of Sciences**(Computer vision and machine learning, multimedia signal processing and transmission)

- Master's Supervisor at University of Chinese Academy of Sciences and Fuzhou University, IEEE Senior Member

- Fujian Province's "Hundred Talents Plan" and Quanzhou's High-Level Talent Introduction

- Director of the Industrial Technology Infrastructure Public Service Platform, Ministry of Industry and Information Technology

Achievements in Scientific Research

-Research and Development of Drug Packaging Text Recognition Algorithm Based on Deep Learning

-Research and Development of Fish-Eye Double Eye Depth Estimation Algorithm

-Research and Application of Safety Detection and Early Warning Technology in Smart Factory & Re- identification Algorithm for Uniformed Personnel under Cross-Camera

-Design and Development of Machine Vision Inspection Equipment for Pharmaceutical Aluminum Tubes and Packaging Boxes

Chao Jian- Shu

- University of Technology Munich, PhD

- Shanghai Jiao Tong University, Master's degree
- Northeastern University, Bachelor's degree

Smart Lab

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Laboratory for New Material Automation

Harbin Institute of Technology-Shenzhen Institute of Materials Gene

The intelligent manufacturing technology is adopted to develop the automatic preparation system of materials, which realizes the breakthrough from manual operation to machine automation in the preparation of materials in the laboratory.

performance parameter:

Boost team creativity

The experiment can be conducted 24 hours a day, freeing up labor for other high-value-added tasks.

Enhance experimental safety

Replace manual experimentation to avoid safety hazards such as high temperature, high pressure, cutting, and pressing caused by laboratory equipment.

Ensure experimental consistency

Automated operations with high precision and stable rhythm ensure unique experimental variables in each iteration, thereby enhancing the efficiency of material development and iteration.

Intelligent Laboratory for New Materials

China Rare Earth Group

中國稀土集團
CHINA RARE EARTH GROUP CO.,LTD.

Intelligent manufacturing and artificial intelligence technologies are adopted to achieve compatibility between metal smelting and mixed pressure sintering processes, as well as flexible selection of different material preparation routes.

performance parameter:

High precision sample preparation accuracy 1mg grade

High throughput mixing, ball milling, and sintering support 6 to 8 channels

High automation sample melting, sintering fully automatic, characterization sample preparation fully automatic(including inlaying, polishing, grinding, cleaning),characteriza- tion module fully automatic:Hardness, XRD, and metallographic analysis were performed, with the second phase involving the upgrade of the automated electrochemical workstation.

High-coverage laboratory can be oriented to the traditional metal smelting route, or it can realize the powder metallurgy mixed pressure burning process route

High efficiency output data continuously prepare all kinds of rare earth solid electrolytes and rare earth structural materials, rare earth permanent magnet materials samples, and immediately characterize, generate massive accurate experimental data, AI-enabled experimental paradigm, accelerate the development of rare earth new materials.

New Material AI Intelligent Laboratory

Kunming University of Science and Technology

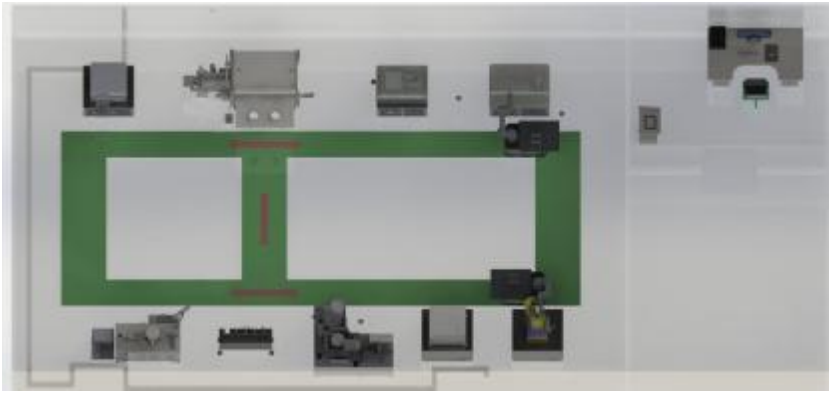
By leveraging intelligent manufacturing and AI technologies, we developed an AI-driven welding material R&D system to accelerate the development cycle of next-generation advanced welding materials.

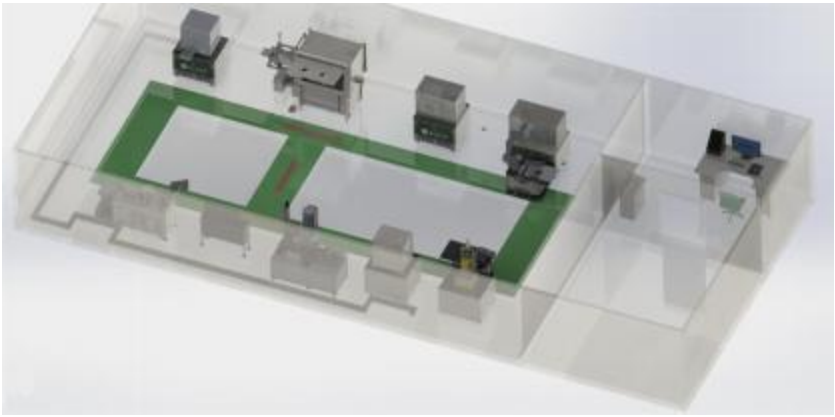
performance parameter:

Improve efficiency: AI replaces the traditional "trial and error method", reducing the number of iterations by ≥60%; **Cost saving**: Replace manual operation process, reduce material waste,cost reduction of more than 30%per experiment;

Safety and environmental protection: Unmanned laboratory,reduce the opportun- ity of experimenters to contact harmful substances, improve the safety of experiments.

Collaborative optimization: Synchronize the optimization of high temperature strength, wettability, solderability, welding density, interlayer bonding strength, comprehensive cost and other strong coupling indicators (≥6 items).





Development System of Liquid Phase Surface Chemical Treatment Agent

A New Surface Treatment Agent Formula Developed by a New Material Company

By adopting automation and artificial intelligence technologies, the traditional time-consuming and error-prone chemical solution preparation and characterization processes are transformed into an efficient, precise, traceable, and data-driven research model.

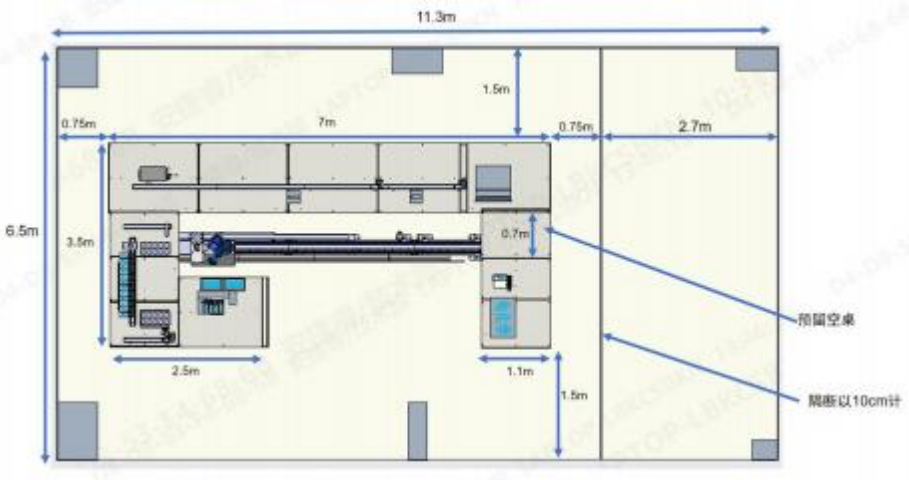
performance parameter:

High-precision liquid preparation system: Purchase high-precision liquid preparat- ion system and high-sensitivity digital balance: liquid preparation accurate to 0.01 ml, eliminate human liquid preparation deviation. Reduce the chance of laboratory personnel contact with harmful substances, improve the safety of experiments;

Improve efficiency: prepare samples 24 hours a day, and prepare dozens of samples at the same time,the experimental throughput is increased by 10-100 times;

Data consistency: pipetting accuracy <1%CV, sample surface corrosion reaction, acid-base titration real-time video recording, millisecond timing control, reliable and traceable experimental data;

Data structuring: operation data is stored with binding to the original data, and the data is structured in a standard structure, providing high-quality fuel for big data analysis, machine learning, and digital twin.



Optimization of Solid State Battery Electrolyte LLZO Lithium LanthanumZirconium Oxide Formula

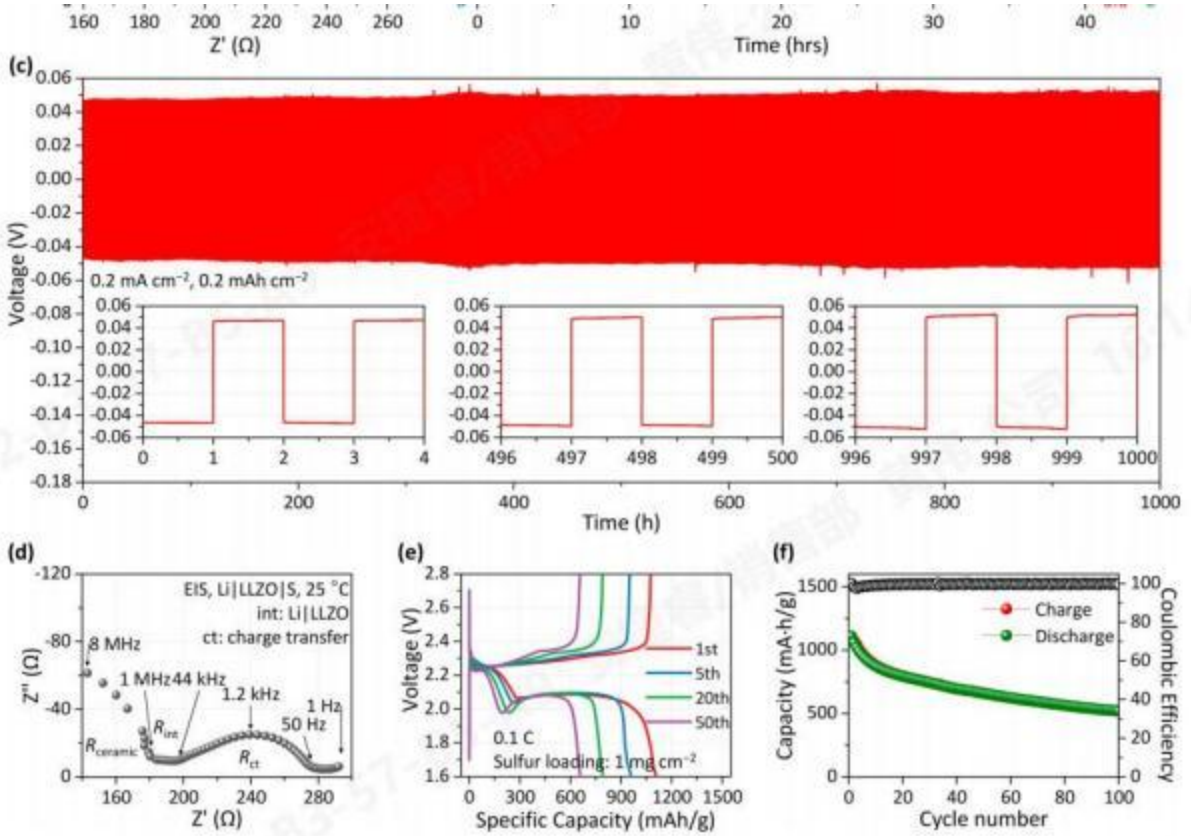
Solid-state battery electrolyte materials currently face R&D bottlenecks, with finding global optimal solutions in complex electrochemical data being as difficult as finding a needle in a haystack. Through the intelligent R&D system for new materials, utilizing automated experimental platforms, high-throughput testing, and machine learning methods, researchers discovered that adding appropriate amounts of tantalum and chlorine to LLZO can enhance the conductivity and activation energy of solid-state battery electrolytes.

Find the performance window of the core element Li of solid-state battery based on the
database:

6%Excess Li samples show uniform and dense microstructure, and the consistency of relative density and conductivity is the best, which provides a key microstructure basis for the preparation of high-performance electrolyte.

Conclusi on:

Li Shortcomings (2%): Failure of densification, poor and inconsistent performance.
LiExcess (8%): the formation of lithium-rich impurity phase at the grain boundary hinders ion transport.

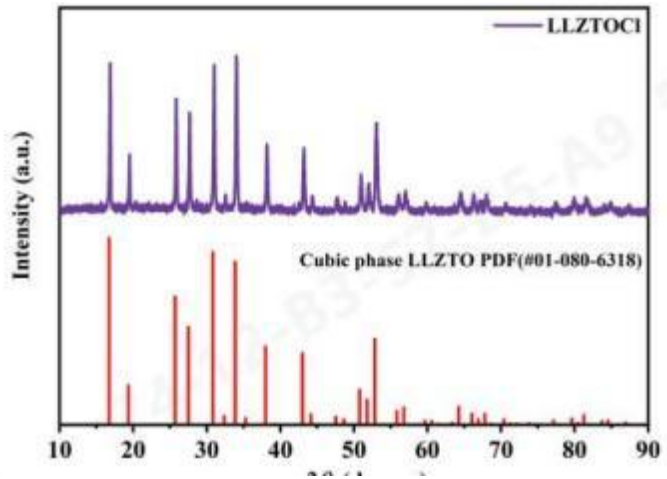


1

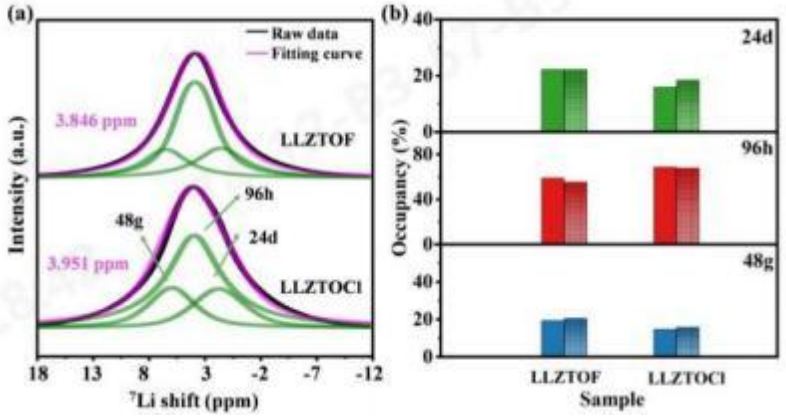
Li is 6%:to obtain uniform, dense microstructure, which lays the foundation for high performance. System value: accurately locate this narrow "sex" through the high-throughput system.

System Value: Accurately locate this narrow "performance window" via the high-throughput system.

Optimization of Solid State Battery Electrolyte LLZO Lithium Lanthanum Zirconium Oxide Formula



1. The XRD spectra demonstrate uniform distribution of La, Zr, Ta, O, and Cl in the sample, confirming that under specific processing conditions, Cl can be incorporated into the garnet polymer.



2. (a) NMR spectrum (b) XRD refinement (colored fill bars) demonstrate that the addition of chlorine has a certain effect on conductivity.

Li6.5La3Zr1.5Ta0.5O11.925Cl0.15（LLZTOCl）samples were prepared by solid-state method based on high-throughput laboratory and machine learning optimization. It was found that chlorine doping has a positive effect on the stability and ionic conductivity of cubic garnet（c-LLZO）.

NW spectroscopy and X-ray refinement results indicate that the introduction of chloride ions enhances the structural stability of the 0-77Zr framework, while effectively reducing the Coulombic repulsion between adjacent lithium ions, thereby improving the material's air stability. After chloride ions replace oxygen ions, the local electric field distribution may change, leading to a redistribution of lithium ions between the 69U and b 86 sites. This distribution change increases the occupancy of lithium ions at the 69U site, and the energy barrier for migration from the 69U site to the b86 site is lower than that for migration from the b86 site to the b86 site, thus promoting rapid lithium ion migration and enhancing the ionic conductivity of the LLZTOCl sample.

AI-quality testing

百度智能云

Baidu Intelligent Cloud has been recognized as a strategic industrial quality inspection partner and an official certified enterprise.

Material products AI quality inspection

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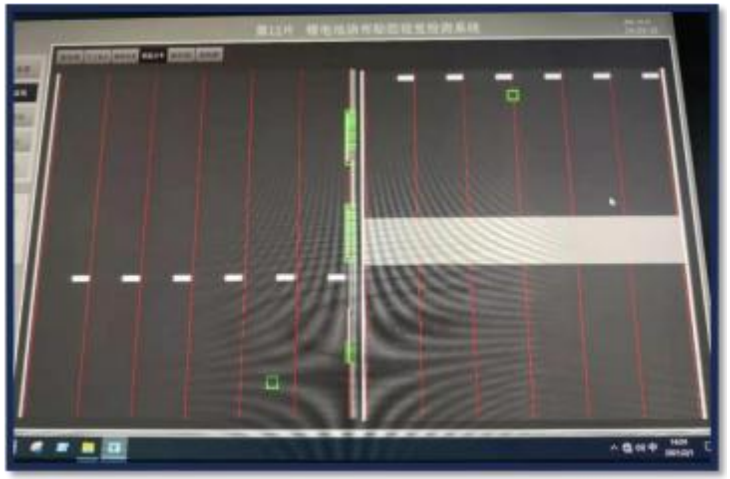
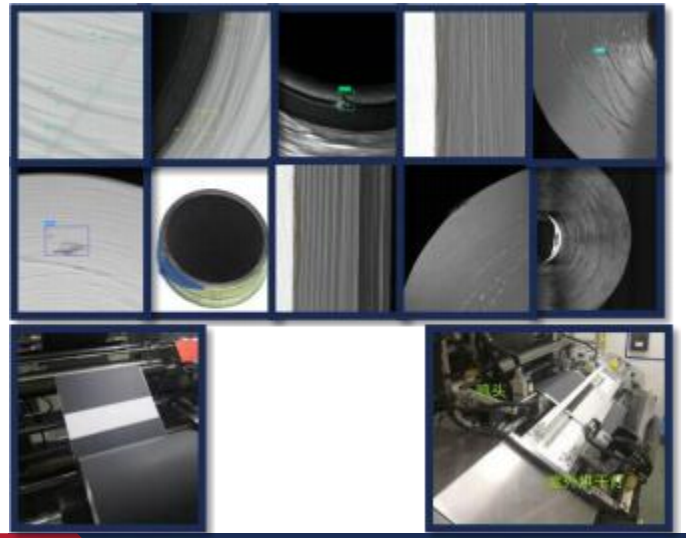
Single Machine Detection Equipment

cylindrical workpiece
hexahedral workpiece
irregular workpieces

On-Line Examination System



lithium battery electrode
chemical fiber
carbon fibre
Aluminum/Steel Coil



Material products AI quality inspection

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Cylinder Detection Equipment

- **Patent Product**

- Defect Detection of Cylindrical Products (Tungsten Carbide, Ceramics, Magnetic Materials, etc.)

- **End surface defects:** include common defects such as missing material, cracks, and no light (precision 0.015mm)

- **Chamfer defect:** Common defects such as chamfer size, notch, reverse, missing, and scratch; (precision 0.025mm)

- **Bar body defects:** common defects such as threads, holes, scratches, cracks, color differences, dirt, marks, rust spots, and corrosion; (precision 0.05mm)

- **Dimensional inspection:** Length and outer diameter measurement (accuracy 0.05mm & 0.5 μm)

- **Overall indicators:** Miss rate ≤ 0.5%, misjudgment rate ≤5%;

Material products AI quality inspection

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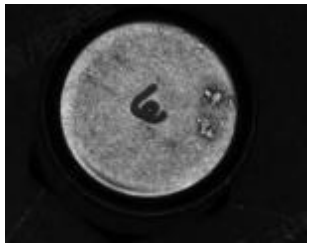
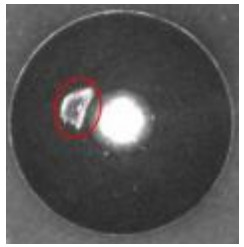
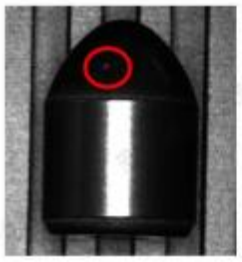
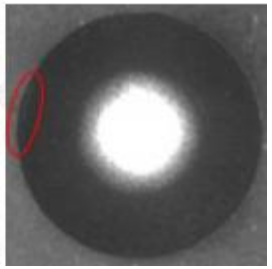
Gear Tooth Visual Inspection Equipment









- **Patent Product**

- Product Defect Detection of Ball Teeth (Hard Alloy, Ceramic, etc.)

- **Detection range**: The size range of the column diameter is 5～14mm, the height is 8～20mm, and the ratio of height to column diameter is ≤1.6. The defects can be detected as adhesive, front drop, rear drop, adhesive hole, trace, and dirt.

- **Dimensional tolerance**: The diameter of the cylinder was ±0.05 mm and the height was ±0.1 mm.

- **Minimum defect recognition size:** 0.1mm

- **Whole machine index**: The false detection rate is less than 0.5%, and the false positive rate is less than 5%.

Material products AI quality inspection

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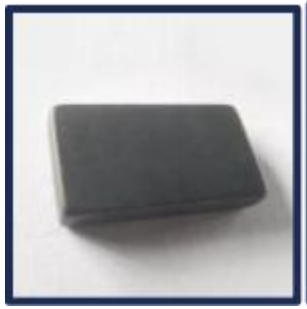
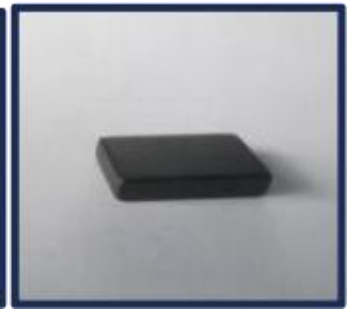
Hexahedral Detection Equipment





- patent product

- Defect Detection of Hexahedron Products (Tungsten Carbide, Ceramics, Magnetic Materials, etc.)

- **Substrate inspection:** Includes common defects such as material deficiency, cracks, pinholes, and lack of light exposure

- **Coating defects:** include corrosion, scratches, cracks, exposed substrate, poor coating, and irregularities Common defects such as material issues

- **Dimensional inspection:** length, width (±0.005mm), height (±0.005mm)

- **Geometric inspection:** Parallelism, perpendicularity, roundness, and concentricity (±0.01 mm)

- **Overall indicators:** 漏判 rate ≤0.5%, misjudgment rate ≤5%;

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robotization

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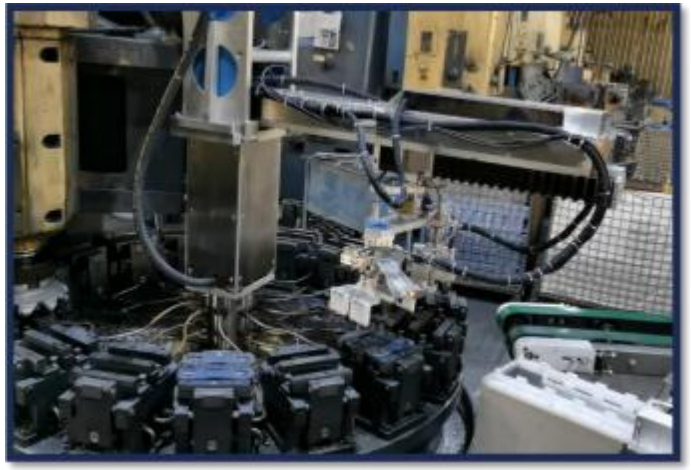
Tiered Warehouse Facility

Dedicated Device



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