

Product for Solutions

■ Providing Products for Saving Energy, Conserving Resources and Protecting the Environment

Core Devices and Key Innovative Technology For Achieving Higher Performance in Hybrid Cars

Technological innovations in hybrid cars are the product of advanced technology developed with the highest priority on ecological issues.

Hybrid cars have the unique feature of achieving high levels for both ecological and power benefits produced by a synergy of the conventional power exiting the engine with the improved motor power delivered by the high power supply voltage and the electric system with enhanced functionality.



Hydrogen Storage Alloy for Nickel Hydrogen Secondary Battery Essential for High Voltage, High Output and Extending Use Time

Many hybrid cars use a nickel hybrid secondary battery that is capable of achieving greater energy density, higher voltage and more enhanced output than the lead battery. This technology improves the performance of hydrogen storage alloy, which is essential for enhancing the performance of the nickel hydrogen secondary battery.

FMI-II-500R *Melting Furnace for Hydrogen Storage Alloy*

A vacuum induction melting furnace is used to melt and cast the materials to produce the alloy with the specified composition.



ULVAC, Inc.

Features

- The cryopanel helps achieve a high level of degassing.
- The furnace allows a high volume of active metal to be added and controlled.
- Ingots are kept extremely clean.
- Single-direction agitation helps to keep the component uniform.
- The furnace heats up quickly and is easy to operate.

FHH-75PHGS *Heat Treatment Furnace for Hydrogen Storage Alloy*

A vacuum heat treatment furnace is used to heat the casting to approximately 1,100°C to ensure that the cast material is uniform.



ULVAC, Inc.

Features

The applications for vacuum sintering technology have greatly expanded in both the industrial and consumer markets. In recent years, high performance rare earth magnets have been used in computer drive motors, and magnetic resonance imaging (MRI) devices are used for medical applications. Tantalum capacitors are used in cellular phones.

Product for Solutions

Sintered Rare Earth Magnets for Drive Motors Producing Lighter Motors with Higher Output

One of the key components of a hybrid car is the motor, which contains a rotor with a permanent magnet driven by electromagnetic force, which runs synchronized with the frequency of three-phase alternating current. There is an increasing need to reduce the weight of motors and produce higher output. The permanent magnet used in these motors is a sintered neodymium* magnet, which is small in size yet has a remarkably high magnetic force. It is expected that there will be significant growth in the use of sintered neodymium magnets in applications which require a small footprint and high performance.

* Neodymium (Nd): A rare earth metal. Atomic number 60. Atomic mass 144.2. A member of the lanthanide series.

FMI-I-500R

Vacuum Induction Melting Furnace

This melting furnace is used for strip casting. The rapid solidification process allows alloys to be cast with a specified composition and structure.

Features

- The cryopanel helps achieve a high level of degassing.
- The furnace allows a high volume of active metal to be added and controlled.
- Ingots are kept extremely clean.
- Single-direction agitation helps to keep the component uniform.
- The furnace heats up quickly and is easy to operate.



ULVAC, Inc.

Vacuum Sintering Furnace

Magnets are pressed in a die while a magnetic field is applied to them, and then heated in a vacuum to approximately 1,100°C in this heating furnace for liquid phase sintering.



ULVAC, Inc.

Features

- The in-line system helps to produce high quality products, and improves productivity.
- A highly reliable system with a successful track record.

Hydrogen Decepritation Furnace

In this hydrogen decepritation furnace, an alloy is placed in a hydrogen atmosphere to collect hydrogen, and then heated in a vacuum to 600°C. The change in volume which occurs during the process of hydrogen collection and release causes the alloy to break into particles spontaneously.

Features

- The in-line system helps to produce high quality products, and improves productivity.
- A highly reliable system with a successful track record.



ULVAC, Inc.

Aging Furnace

This furnace increases the coercive force of the sintered magnet by heating it to approximately 500°C.



ULVAC, Inc.

Features

- The in-line system helps to produce high quality products, and improves productivity.
- A highly reliable system with a successful track record.

Product for Solutions

High Capacity Smoothing Capacitor for Higher Voltage Inverters

In automobiles, capacitors are used for the control and motor circuits. The aluminum electrolytic capacitor conventionally used as a smoothing capacitor in motor circuits in hybrid cars has been replaced by a film capacitor to achieve higher capacity and greater resistance to high voltage, to meet the need for motors to provide higher output power and have a higher voltage.

EWC / EWE series Evaporation Roll Coater for Film Capacitor

This coating system is used to carry out the vapor deposition of aluminum, zinc and other metal films on plastic films being wound continuously from reel to reel.



ULVAC, Inc.

Features

- The latest winding control technology is used to transfer carriers, allowing for a steady movement of the carrier according to different materials and sizes.
- Select the most appropriate evaporation source, choosing from induction heating, resistance heating and EB heating, depending on the purpose of vapor deposition.
- Offers a variety of pre-/post-process mechanisms to optimize processing conditions.
- Uses instruments including film thickness monitors for measuring optical transmission, film thickness monitors for eddy currents, and resistance value monitors to make online measurements.

High Voltage Regulator Power IC (for ultrathin wafers)

In hybrid cars, power ICs are used to regulate the high voltage and high current. The higher integration in the IC makes electrical discharge more likely and creating the need for additional features to release the heat generated to the surroundings. For this reason, some power ICs employ wafers with a thickness of 0.3 mm or less (ultrathin wafers) to carry a high current with minimum loss.

SRH-420MC Sputtering System

This coating system is designed to solve problems faced when depositing film on ultrathin wafers, namely that wafers break easily and bend a large amount, and that the temperature of the wafer becomes very high when the film is being deposited.

Features

- The SRH-420MC (for $\phi 100$ to 200 mm) can handle ultrathin wafers.
- SRH series system is designed and manufactured to comply with the SEMI safety standard.
- Many different process chambers can be installed, making it possible to configure the system in a number of ways, for example, inexpensive models, full scale production models with longer maintenance intervals, or mixed target processing models for producing different types of products.
- Since the individual process chambers are isolated from one another, different conditions can be selected for each process chamber.



ULVAC, Inc.

Product for Solutions

>70% Reduction in Power Consumption ECO-SHOCK

Power Saving Accessory for Dry Pumps

This revolutionary dry pump accessory is designed for use with the positive displacement dry vacuum pump used in the semiconductor and flat panel display production lines and reduces the dry pump power consumption 70% or more.



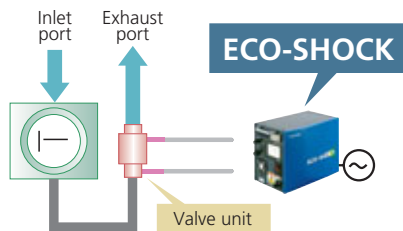
ECO-SHOCK installed in ULVAC ENTRON sputtering system.



ULVAC, Inc.

Operating Principles of ECO-SHOCK

● Example of ECO-SHOCK in use



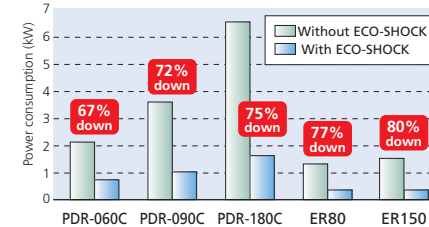
It reduces the dry pump workload by evacuating the space between the dry pump body and valve unit to reduce the amount of gas backstreaming to the last stage.

Conventional techniques for saving the energy of dry pumps include optimization of the volume of the dry pump itself and employment of a d.c. motor. ECO-SHOCK pumps the gas flowing out from the exhaust port by the small built-in type dry pump and reduces the gas compression work of the last stage of multi-stage roots.

ULVAC is planning to put vacuum equipments on the market, installing ECO SHOCK as a standard component.

Energy Saving Effect of ECO-SHOCK

● Power saving effect



Energy saving effect has been achieved by lowering the pumping speed of ECO-SHOCK to less than 3% as compared with that of the dry pump, thereby energy saving effect of the dry pump and ECO-SHOCK has been optimized for energy saving of the dry pump. ECO-SHOCK can reduce power consumption by 70% through 80%. Furthermore, electricity charges for air conditioning of the pump room can be reduced, because generation of compression heat is reduced by the reduced gas compressing work of the dry pump and the heat generated by the dry pump in the installation atmosphere can be reduced. Also noise and vibration levels are reduced by reduction of the load of the dry pump gas compression work.

● Effects of power-saving attachment ECO-SHOCK

Model name	PDR-060C	PDR-090C	PDR-180C	ER80	ER150
Pumping speed (L/min)	1,300	2,100	3,980	1,300	2,500
Actual power consumption (kW)	2.1	3.6	6.6	1.3	1.5
Actual power consumption when ECO-SHOCK is used	0.7	1.0	1.6	0.3	0.3
Power reduction percentage	69%	72%	76%	77%	80%

Economical Effects by ECO-SHOCK

● Comparison of costs when ECO-SHOCK is installed in the ULVAC Model PDR-090C pump (per unit)

	Initial costs	Running costs (electricity charge for 2 years)	Maintenance costs	Total
With ECO-SHOCK	¥298,000	¥210,240	¥30,000	¥538,240
Without ECO-SHOCK	—	¥756,846	—	¥756,846
			Difference	¥218,606

These costs are estimated on the assumption that the pump is continuously run for one year (365 days x 24 hours) and the electricity charge is 12 yen per kWh. If 100 dry pumps are used per line, for example, more than 20 million yen can be saved because about 218,000 yen can be saved per unit in 2 years.

Product for Solutions

Solvent Free Photo Resist Stripping Process - Drastic reduction of Chemical solvent -

ENVIRO™

Single-Wafer Photo Resist Stripping System

Enviro offers various processes for Low-k application as well such as low pressure and low temperature without damage to low-k material. Solvent free process contributes to environment conservation. The name of this product "ENVIRO" is a derivative of "environment".

This system was developed by ULVAC Technologies, Inc., USA, and is made and marketed by them.



Features

- Only DI water is used for cleaning and no sulfuric acid, amine hydroxide and isopropanol are used, which are harmful to human body.
- Consumption of DI water has been reduced to 20% as compared with the conventional process.
- DI water used for cleaning is recyclable.
- Since no wet cleaning process being required, no space is required for the wet bench, resulting in dramatic saving of space.
- Total processing cost per wafer has been reduced to less than 1/5.

35% space reduction as compared with existing multi-chamber type

SMD-X series

Series Single-Substrate Sputtering System for LCD

While coping with requirements for large-sized mother glass for liquid crystal displays, ULVAC has been making efforts to reduce the size and costs of SMD series systems. This single-substrate sputtering system for LCD has been the world leader since it was developed in 1992. ULVAC is making steady efforts for further improvement with future needs in mind.



ULVAC, Inc.

Features

- Installation space has been reduced by 35% as compared with the conventional multi-chamber type.
- The number of deposition chambers has been reduced from four to one, thereby the number of maintenance parts being reduced to one-fourth.
- Use of new material for the deposition shield has extended the life of cleaning cycle by 40%.
- Operating power consumption has been reduced by changing the hot plate system with the lamp system.
- The same power supply is used for the cathode and lamp heater, which can be changed over with a selector, thereby significant power saving and cost reduction have been realized.

68% reduction of power consumption

FSCn-2060

Continuous Vacuum Sintering Furnace for Fabrication of Tantalum Capacitor

This furnace is used for sintering tantalum (Ta) elements for small-sized, high-capacity capacitors. More specifically, after binder is added to fine tantalum powder several microns in average particle diameter and the mold pressed into several millimeters is removed of binder in a vacuum at a temperature of 200 to 400°C, the mold is sintered in an atmosphere of 10⁻³ Pa or less at 1300 to 1600°C (2000°C at the highest). The processed mold is cooled and discharged into the atmosphere.

ULVAC, Inc.



Features

- Power for the heating system has been reduced (68% reduction at 1800°C) by changing the structure of the furnace.
- The structure of the heater and reflector has been changed so that they can be easily disassembled and reassembled. As a result, they can be replaced within an hour (actual work hour), which used to take a day per chamber.
- The life of the heater, reflector and heat insulator for the transfer dolly has been extended three to four times over the predecessor model.

Product for Solutions

Employment of Cold Medium free from Ozone Layer Depletion

DFB series

Vacuum Freeze Drying Unit

Capability of high precision temperature control has made the DFB series suited to the development and production of medicines, such as vaccine, serum, antibiotics and others.



ULVAC, Inc.

Features

- Employment of cold medium R-404A free from ozone layer depletion
- Employment of the brine circulating system permits optimum temperature control, making it best suited to the production of medicines that require highly sophisticated operating conditions.
- Light weight and compact size: 20% reduction as compared with predecessor model.
- 80% reduction of brine consumption by employment of a small-sized plate heat exchanger
- Capability of shelf temperature control from -40°C to +70°C.
- Capability of simultaneous cooling of the shelf and cold trap permits evacuation immediately after completion of pre-freezing.

For versatile application and 40% recycling

ULVAC i Sputter

Standard Sputtering Apparatus



ULVAC, Inc.

The "i sputter" is a unique system that permits reuse of about 40% of system components even when operation is switched over to other process, not to mention easy and simple operation and consideration to environment.

The name of this system "i" is based on the "i" concept" of friendliness to the environment and humans, proposed by Mr. Junji Itoh, Director, National Industrial Research Institute.

Features

- Capability of modification according to change of research purpose by reuse of platform (recycling percentage 40%).
- 40% space saving as compared with the predecessor model by integrating the control system and the basic unit in one unit.
- Employment of the automatic process recipe management system has reduced 19 items of process operation to 3 items, as compared with the predecessor model.
- At-site startup time has been reduced to one-third or from 6 to 2 days.

Product for Solutions

Newly developed visible light responding photocatalytic film - Wide range of application for household and medical equipment

- 100A Type** Visible Light Responding Photocatalytic Film Fabricating System
- Model PCC-2** Photocatalytic Evaluation Checker

The visible light responding photocatalytic film fabricating system has enabled mass production of highly durable visible light responding photocatalytic products by reforming the substrate surface within a short time.

Photocatalytic Reaction under Visible Light

Titanium oxide film has photocatalytic activities, such as antifouling, antimicrobial and other activities, under UV light of less than 380 nm. As such, it has raised great expectations in practical application. However, it has a drawback in that only 5% of solar light can be utilized with ultraviolet light. The new technique ULVAC has developed has made it possible to reform the conventional titanium oxide film to one that responds to visible light by short time treatment.

Also this technique permits treatment within a short time and is not limited by substrate size, making it possible to apply it to a large-sized substrate processing system. Thus new photocatalytic products can be fabricated by applying this technique to visible light response. This means that photocatalytic products that have been almost limited to outdoor applications can now be used indoors because photocatalytic activities can be maintained simply by illumination with a fluorescent lamp.

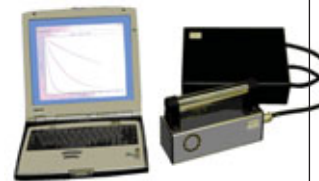
This technique was applied to steel plates for building materials that were jointly made by a Japanese steel maker and ULVAC for evaluation, and the changes in the number of yellow staphylococcus were checked under illumination for 8 hours using a 1000 lux white fluorescent lamp. The number of bacteria decreased from 100,000 to 10 (detecting limit) on a catalytic film treated by using this technique, while the number of bacteria did not change with the ordinary titanium oxide film.

Fields of Application of VS Light Responding Photocatalytic Film

The fact that the photocatalytic activity has been expanded to VS light response has dramatically expanded the range of application, because the photocatalytic activity can be maintained only by illumination of fluorescent light. It is now possible to use this film for the interior and exterior parts for automobiles and buildings, illumination of tunnels, and parts for bathrooms, toilets, kitchens, building materials, hospital rooms, operation rooms, and others.

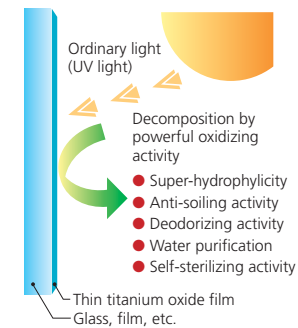


[100A Type]
Visible Light Responding
Photocatalytic Film
Fabrication System
ULVAC, Inc.

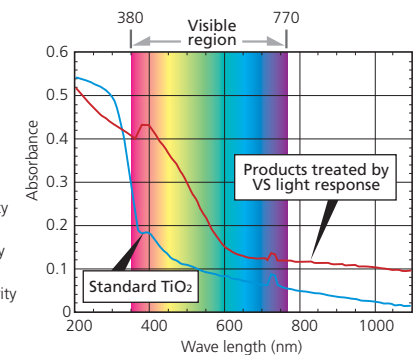


[Model PCC-2]
Photocatalysis Evaluation Checker
ULVAC-RIKO, Inc.

Self-cleaning effect of photocatalytic activity



Absorption spectrum of TiO₂



Application of photocatalytic reaction

