

# JFE's Technology Contributes to Worldwide Sustainable Growth

The JFE Group delivers high-end steel sheets, as well as a wide range of other products. Our cutting-edge technology contributes to the development of society and comfortable living environments.

## The world's first nanotech high-strength hot-rolled steel sheets for automobile parts NANO HITEN

High-end steel sheets have come to be used extensively in automobile. Recently, in order to further reduce weight and improve crashworthiness, demand has risen for higher strength steel. JFE successfully developed a new higher strength steel with excellent stretch flange formability using nanometer-sized carbides that are ten times finer than those of conventional steels. This steel, named "NANO\* HITEN™," is the first highstrength automotive steel to use nanotechnology.

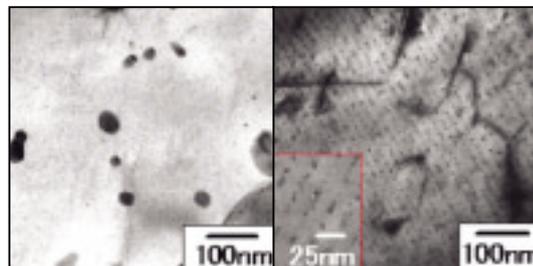
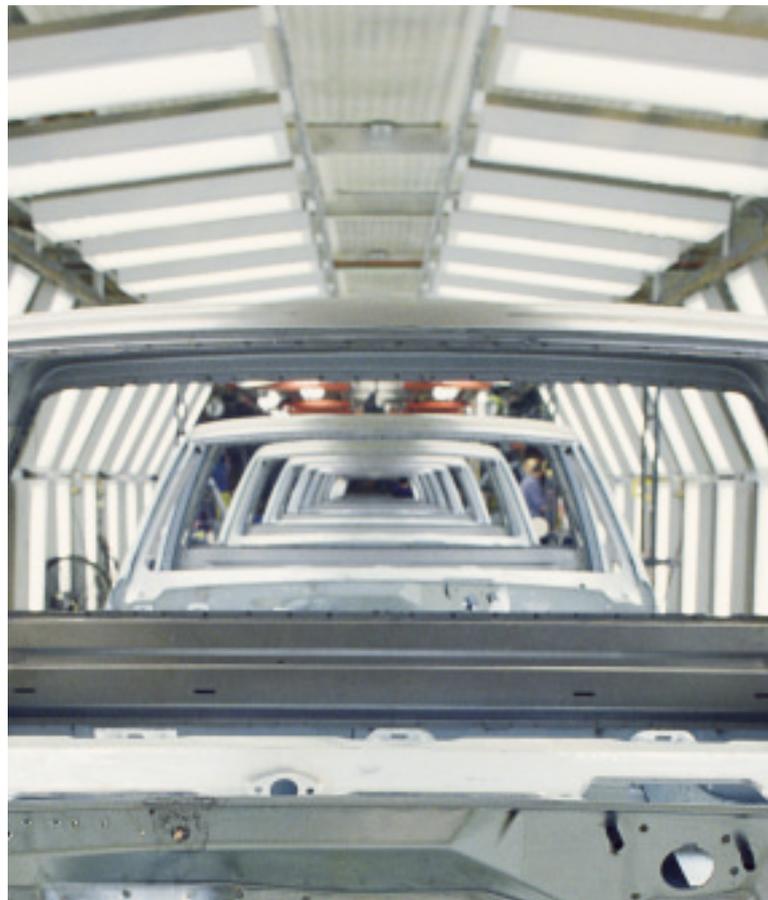
The main technique in the manufacturing process for



the new steel is the combining of the ferrite matrix and the fine carbides. Generally, fine carbides coarsen easily in a ferrite matrix. JFE successfully achieved fine carbide retention in a ferrite matrix during the manufacturing process. The new technique has made it possible to exhibit both high strength and excellent formability.

"NANO HITEN™" has won many prizes, and in the year ended March 2008 received The 21st Century Encouragement of Innovation Prize, at Japan's national commendation. "NANO HITEN™" has been adopted as a material for automobile suspensions and crashworthy equipment, and its applications are expected to increase in the future.

\*New Application of Nano Obstacles for dislocation movement



Left / Conventional steel carbide  
Right / NANO HITEN carbide



Automobile suspension components manufactured using NANO HITEN



**New high-corrosion resistance stainless steel contributes to resource conservation**  
**JFE443CT**

With prices for metal resources soaring, there is a heightened sense of crisis concerning resource scarcity. While SUS304 (austenitic stainless steel), the most common stainless steel material, offers excellent corrosion resistance, it is affected significantly by the price of nickel because of its 8% nickel content.

At JFE, we developed JFE443CT, the world's first ferritic stainless steel sheets, which offer corrosion resistance equal to SUS304 while containing absolutely no nickel or molybdenum, two rare metals. This product emerged from JFE's discovery that we could achieve a marked corrosion resistance improvement effect by adding copper while simultaneously increasing the amount of chromium.



JFE443CT was awarded the Nikkei Sangyo Shimbun Award for Excellence in Products and Services in 2006, the Fuji Sankei Business-i Advanced Technology Grand Prix Sankei Shimbun Co., Ltd. Prize in 2007 and the Ichimura Prizes in Industry - Contribution Prize in 2008. It has also earned a strong positive evaluation from society as a product contributing to resource conservation. Because the adoption of JFE443CT for a variety of applications including commercial kitchenware, building materials and industrial machinery is expanding rapidly, JFE has increased production amount to meet demand and is contributing to society.

Left /  
Cistern tank  
Right /  
Home cookware



Internal parts for thermo-pots



### JFE's Technology Contributes to Worldwide Sustainable Growth

#### Solar battery boasts world's top class conversion efficiency through **SILICON WAFERS**

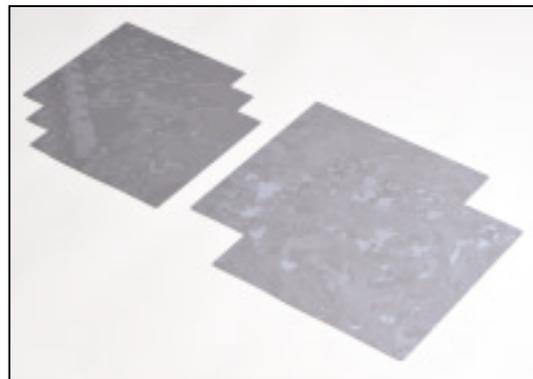
Because they do not emit CO<sub>2</sub> when generating electricity, solar batteries that convert the sun's energy into electric power have attracted interest as a trump card among global warming prevention measures. At JFE, we began production of silicon wafers for solar batteries in 2001. As of 2007, JFE had annual production capacity of 180-megawatts, equivalent to roughly 5% of the world's total solar battery power output.

By utilizing the technological capabilities cultivated through its casting technology for steel manufacture, JFE produces silicon wafers for solar batteries that achieve solidification structure uniformity. By using JFE's polycrystalline silicon wafers, some solar cells have achieved and maintain the world's highest level of conversion efficiency of 17% or more.



In 2005, JFE applied its steel production technology to begin manufacturing solar grade silicon (SOG-Si) in response to the shortage of the basic raw material, high-purity silicon (polysilicon), that resulted from the rapid increase in solar battery demand. SOG-Si ensures quality equivalent to polysilicon, and today JFE maintains a share of the market for solar battery wafer raw materials with an annual production capacity of over 400 tons.

JFE will continue to take advantage of its steel manufacturing technology in the future to deliver products and raw materials that contribute to the prevention of global warming.



Polycrystalline silicon wafers  
for solar batteries



Silicon block



Silicon ingot



**Support for lithium ion secondary batteries  
FINE SPHERICAL GRAPHITE POWDER**

Today's world requires great amounts of energy for a wide range of applications such as advanced telecommunications and transportation, yet also demands environmentally friendly technologies and reduction of fossil fuel use. The development of storage battery and other electrical storage technologies is therefore an urgent issue. JFE has demonstrated the superiority of its technology by developing products such as lithium ion secondary batteries (LIB).

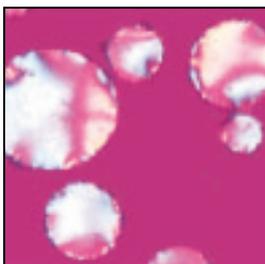
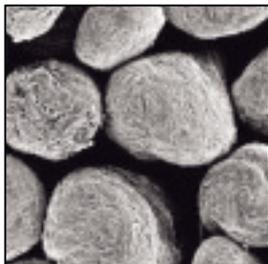


LIB made their way into practical use during the 1990s as batteries for small, mobile devices. JFE's fine spherical graphite powder has been adopted as a high performance negative-electrode material. Applications for LIB in sectors such as hybrid automobiles and electric vehicles are expected to grow in the future.

JFE produces fine spherical graphite powder using a proprietary technology to generate mesophase spheres (spherical crystals) by the heat treatment of coal-tar pitch, a by-product of the coking furnaces used in the steel manufacturing process. JFE then extracts the spheres and converts them to graphite. The resulting product's excellent crystallinity and high filling property contribute to improving LIB capacity and cycling characteristics (electrical charge and discharge frequency).

The high performance activated carbon that highly activates the spheres is also being utilized in the electrode material for electric double layer capacitors, a new electricity storage device, for which additional demand is anticipated in the future.

Fine spherical graphite powder



Mesophase spheres

**JFE's Technology Contributes to Worldwide Sustainable Growth****New system goes easy on the marine environment  
SHIP BALLAST WATER TREATMENT SYSTEM**

To maintain hull stability and sailing safety, seawater (ballast water) is pumped into the ballast tanks of empty cargo vessels and tankers. This ballast water is later discharged at ports of loading, where negative affects on ecosystems have been pointed out in that the ballast water contains marine organisms from an ocean area different from the area where the organisms are released. In 2004, the International Maritime Organization (IMO) adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, and when this agreement takes full effect, signatory countries will be required to install equipment to properly process the ballast water on board from other countries.



JFE is already developing a ballast water treatment system for ships that is friendly to the marine environment. This latest system treats ballast water by using a high performance filter to return many living organisms to their original sea zone when seawater is pumped into the ballast tanks of a ship, then processing the small plankton and bacilli such as E. coli bacteria in the filtered water using chemicals and cavitation (a phenomenon that generates bubbles by compressing and then rapidly releasing flow velocity), and finally discharging the treated water into the sea after the small quantities of residual chemicals have been neutralized to ensure they are non-polluting.

We will continue to utilize the JFE Group's shipbuilding technology, service water and waste water processing technology, and machine technology to the maximum extent possible to help preserve the marine environment.





0 50 100mm

### Energy solutions in the industrial sector **BIOMASS BOILER / WOOD BIOMASS GASIFICATION FACILITY**

The need to begin converting fuels for power in the industrial sector to biomass or recycled fuels has increased rapidly as a measure for preventing global warming and for addressing the sharp rise of energy prices. At JFE, we have been working proactively for many years to develop technology to expand the use of biomass and recycled fuels.

JFE's biomass boiler is a system that can be adjusted to the type of waste product fuel available, including wood chips, sludge and waste plastic, to meet the needs of a resource recycling society. This summer, JFE will complete such a system for Kishu Paper Co., Ltd.'s Kishu Plant, where it is being eagerly awaited to provide the plant's main source of power.



A wood biomass gasification facility is an advanced system designed to work in harmony with the environment by gasifying wood biomass such as lumber scraps and bark, rather than simply burning them, extracting the gaseous fuel and converting it efficiently into electricity and heat. JFE is currently constructing a similar facility for Daio Paper Corporation's Kani Plant.

JFE will continue to contribute widely to the supply of environmentally friendly eco-energy in the future.