



**Umicore focuses
on 'clean' technologies**



Umicore focuses on 'clean' technologies

Umicore and materials go hand in hand. But did you know that without the metals-based materials we develop, many ordinary things you normally take for granted simply would not exist in such abundance?

Our knowledge of metals offers energy-efficient and environmental-friendly solutions which fit nicely with the growing awareness of the limits to our natural resources and the necessity of dealing with our environment in a sustainable way: "materials for a better life", but also for a cleaner environment.

Umicore – via its many historic predecessors – has been dealing with metals for more than 200 years: we're a true leader in our knowledge of metals.

That knowledge allows us to offer many crucial, yet often invisible, building blocks to be used in rechargeable batteries for laptops and mobile phones, solar cells to power satellites and for solar panels, as well fuel cells to be used in the future generation of environmentally friendly cars. In short, Umicore offers a platform of solutions to generate and store energy in an efficient, sustainable and environmentally friendly way.

Umicore invests heavily in research and development to render these materials increasingly effective and limit the use of scarce resources to the bare minimum. Three quarters of our research efforts go into 'clean technologies', renewable sources of energy such as solar cells and fuel cells, marking our contribution to handling the treasures of our blue planet in a sustainable way.

And the story of Umicore does not end there. Since metals can be recycled almost infinitely without losing any of their inherent qualities, Umicore has also completely mastered that technology as the world's biggest recycler of precious metals. Sustainable development is our business.

The following overview looks at the world of metals, materials-technology and those applications – both commonplace and hi-tech – at which Umicore excels.

Umicore in 2006 invested € 115 million in Research & Development, amounting to about 5% of total Group revenues. And about 75% of that amount goes into our 'clean technologies' platform.

" Umicore aims to close the materials loop. Our hi-tech materials offer society a comprehensive platform of energy-intelligent solutions which allow us to produce, store and renew energy in an environmentally friendly, renewable and sustainable way. Our strategic vision of sustainable development is a common thread through all of our research and development activities."



Marc Van Sande
Chief Technology Officer

SOLAR CELLS

Generating energy

DID YOU KNOW ...

... Umicore is out there, looking for 'little green men'?

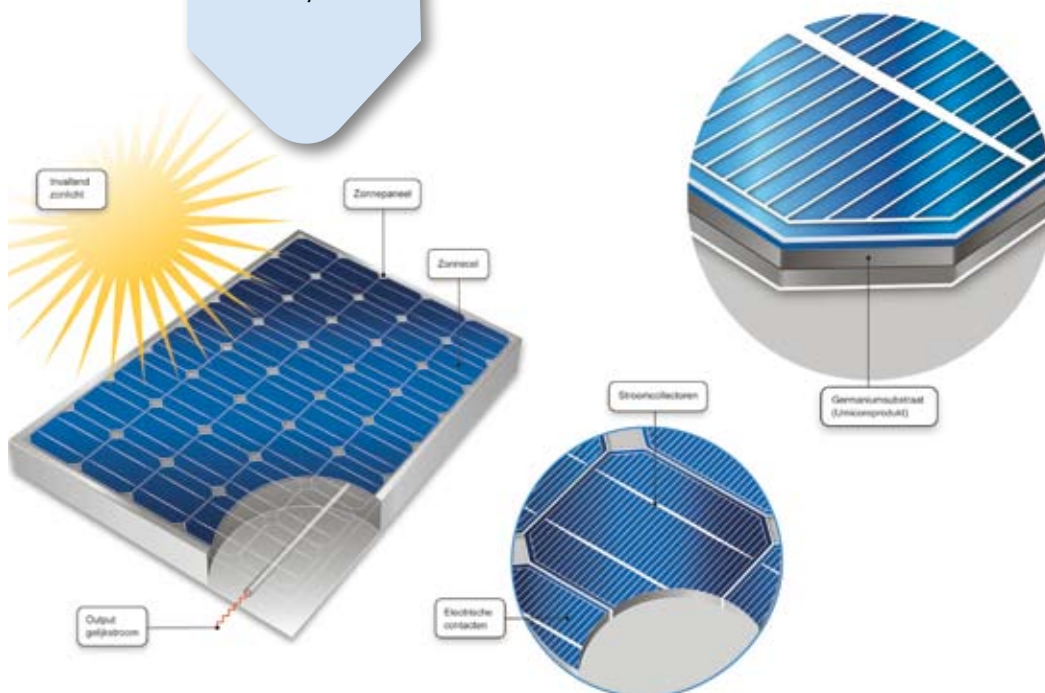
Our germanium substrates are used as the base material for the solar panels used on NASA's Mars Exploration Rovers, the mobile robots which have exploring the red planet since April of 2004. Initially, the mission of Spirit and Opportunity was to last only 90 Mars days (92 days back here on earth) but more than three years on, both robots continue to be operational, partly thanks to the solar cells, a real show of force on a planet where temperatures change by up to 100 °C within one day!

Traditional sources of energy such as oil, coal and gas are limited and pollute the environment. Why then not turn to an energy source which will last a lot longer, the prospects for solar energy have never been better.

As the world leader in germanium, a very rare material, Umicore has been active in this sector for quite some time: our extremely thin and pure germanium substrates (or wafers) are very popular as the base material for solar cells in space, where size, efficiency and power are crucial. These substrates are used in the majority of the satellites launched today ... satellites that have turned the world into the global village it is today, using modern means of communication.

These rare germanium-materials are now also descending to earth: using an array of lenses and mirrors, solar beams are concentrated on a tiny germanium wafer. This requires a lot less germanium and limits the cost difference with silicon, which is cheaper but less efficient.

Umicore has also developed a unique production method allowing for a significant reduction of the cost of producing very pure silicon, to be used in solar cell applications.



Germaniumsubstraten vormen het basismateriaal voor bijzonder efficiënte zonnecellen die voornamelijk op zonnepanelen voor satellieten worden geplaatst. Op germanium gebaseerde zonnecellen zijn tot twee keer meer efficiënt in het omzetten van zonnestralen naar electriciteit dan klassieke, op silicium gebaseerde, cellen. Bovenop de loepzilvere germaniumonderlaag worden andere laagjes materialen "gegroeid" die elk een deel van het spectrum van het zonlicht in energie omzetten.



FUEL CELLS

Generating and storing energy

DID YOU KNOW ...

... Umicore is investing in power plants?

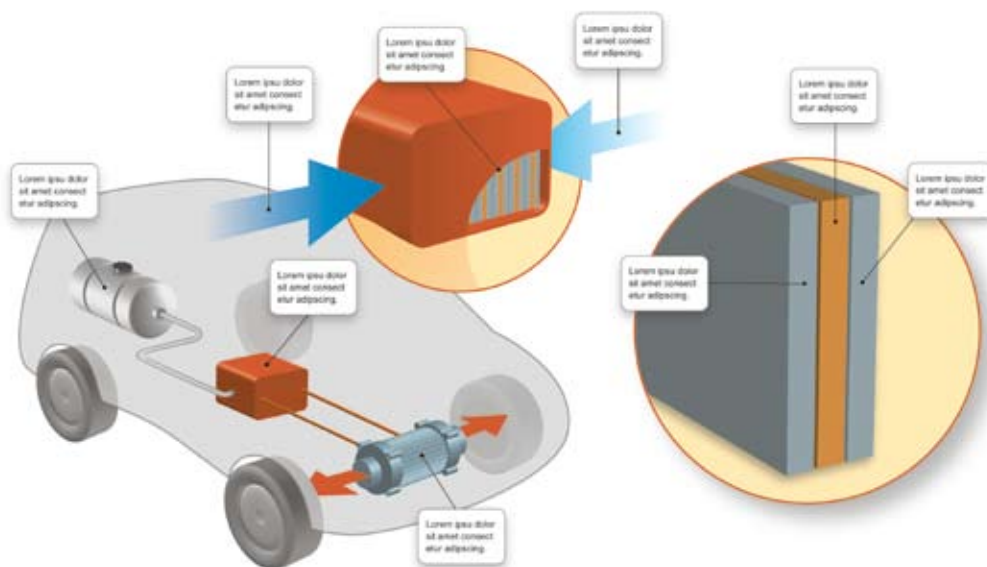
Umicore focuses on the development of electro-catalyst materials for use in fuel cells which trigger the chemical reaction of hydrogen with oxygen. To that end Umicore joined forces with Solvay in 2006. Our SolviCore joint-venture develops the 'heart' of the fuel cell, the reactor where hydrogen reacts with oxygen. The fuel cell operates like a miniature power plant.

Fossil fuels do not only pollute the environment, they are also likely to run out in the not too distant future. Hydrogen could be a good alternative: it is abundantly available and actually offers the perspective of allowing significant reductions in CO₂ emissions.

The mixture of hydrogen with oxygen results in the production of energy with the only by-product being water. Fuel cells are power plants where this reaction happens. They could be used to power the environmentally friendly car of the future: doing away with the problem of exhaust gases and replace them with pure water! We might soon be able to commute to work or travel to our favorite holiday destination knowing that the environment stands to benefit.

Such fuel cells also offer the potential to be much more economical and efficient compared to traditional combustion engines and will significantly cut the dependence of our economy on oil and other fossil fuels.

Fuel cells are like electrical batteries which continuously charge themselves, if fed by fuel. There are still plenty of practical barriers to large scale commercial use but the future is promising.



Hydrogen (H₂) enters the 'negative' side of the fuel cell stack, while oxygen (O₂) enters the 'positive' side. Both sides are separated by a membrane covered with the (precious) metals-based catalyst material, which causes hydrogen to split into positively-charged protons and negatively-charged electrons. The electrons are not able to pass through the membrane and need to travel to the other side via an external channel, creating electricity along the way (the movement of negatively-charged electrons). At the 'positive' side of the fuel cell, oxygen, assisted by the catalyst material, receives both the hydrogen protons and electrons, creating water (H₂O) as end product.

RECHARGEABLE BATTERIES

Energy storage

It wasn't that long ago that you had to pack a spare battery for your mobile phone to avoid running out of power in the middle of an important phone call. The rapid technological development of the materials used in rechargeable batteries has allowed these flashy, flickering mobile phones and PDAs to become not only a lot more powerful but also more compact.

Umicore has a world leading position in the field of cobalt-based materials for the widely used Lithium-ion rechargeable batteries. That leadership position requires enormous technological efforts to be able to continue to meet customer requirements: the batteries need to be increasingly light, powerful and safe.

These batteries are increasingly being used in environmentally friendly hybrid cars, which have more exacting requirements in terms of the battery's weight, power and resistance to shock and heat.

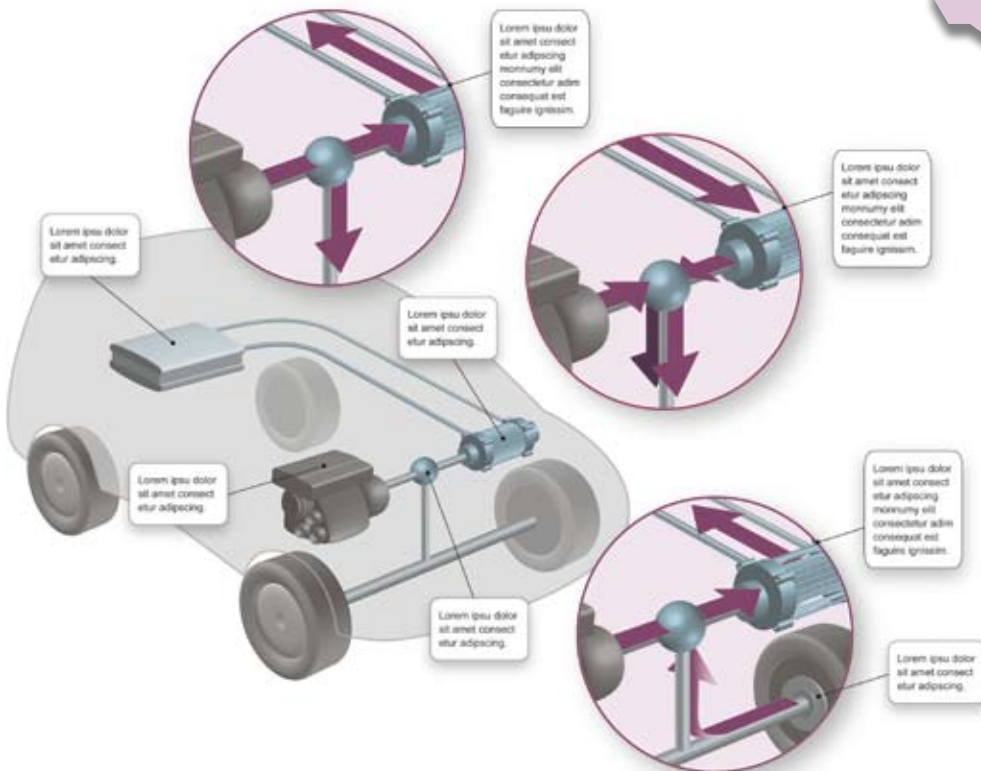
In this regard Umicore is also able to close the loop: old mobile phones – batteries included – can be recycled using our new in-house developed recycling technology.

DID YOU KNOW ...

... Metals enjoy eternal life?

Metals can be infinitely recycled without losing any of their intrinsic properties. This is important in a world where the availability of metals, like many other resources, is limited.

This is a particularly pressing issue at a time when we face seemingly ever-increasing demand for metals. Modern electronic applications for example, typically rely on more than 60 components - six times the number in the '80s.



Hybrid cars rely both on a traditional combustion engine and an electric motor supported by a powerful rechargeable battery. The engine provides most of the vehicle's power, while the electric motor provides auxiliary power, for example for accelerating, passing or even low-speed/low acceleration driving. This combination allows for a smaller, more efficient engine to be used. There is no need to charge the battery externally as the electric power is generated by the gasoline engine or from regenerative braking.

AUTOMOTIVE CATALYSTS

Clean air is our business

DID YOU KNOW ...

... Clean air is our business?

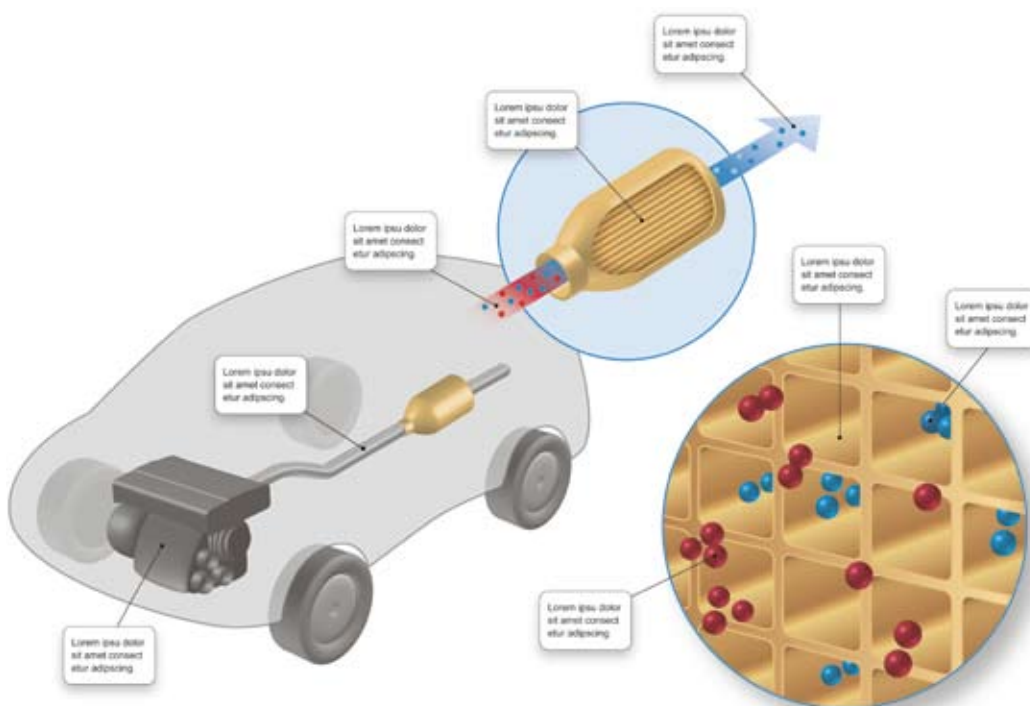
The equivalent of about 10% of the revenues of Umicore's catalyst business is used to fund the activity's research & development programme. One in every six employees at the business is a member of the research department: it therefore does not come as a surprise that Umicore makes new technological breakthroughs every year.

Hydrogen-powered vehicles are currently still a thing of the future but that doesn't mean that the cars which are currently roaming the streets should not fundamentally improve their environmental performance. This is being done thanks to the large-scale introduction of automotive catalysts in the past twenty years. These catalysts can now be found in almost any car.

And once more precious metals enjoy a prominent role: materials with such exotic names as platinum, rhodium and palladium react with harmful emissions from combustion engines (nitrogen oxide, organic molecules and carbon monoxide), rendering these gases largely harmless.

The Group's Automotive Catalyst business has been busy developing, producing and engineering catalysts for a wide range of engines since the 1960s and is currently one of the world's top three players.

Increasingly stringent emission regulation – not just in the European Union or North America but also in Asia and China – encompassing new categories of vehicles (such as trucks and buses) puts a heavy premium on technological development.



The catalytic active material is integrated into a porous substrate through which the exhaust gases (hydrocarbons, carbon monoxide and nitrogen oxide) flow. The precious metals subsequently react with the exhaust gases, rendering them harmless. The entire structure is shielded by a metal housing.



RECYCLING

Recovery of scarce metals

DID YOU KNOW ...

... Umicore operates its own Fort Knox?

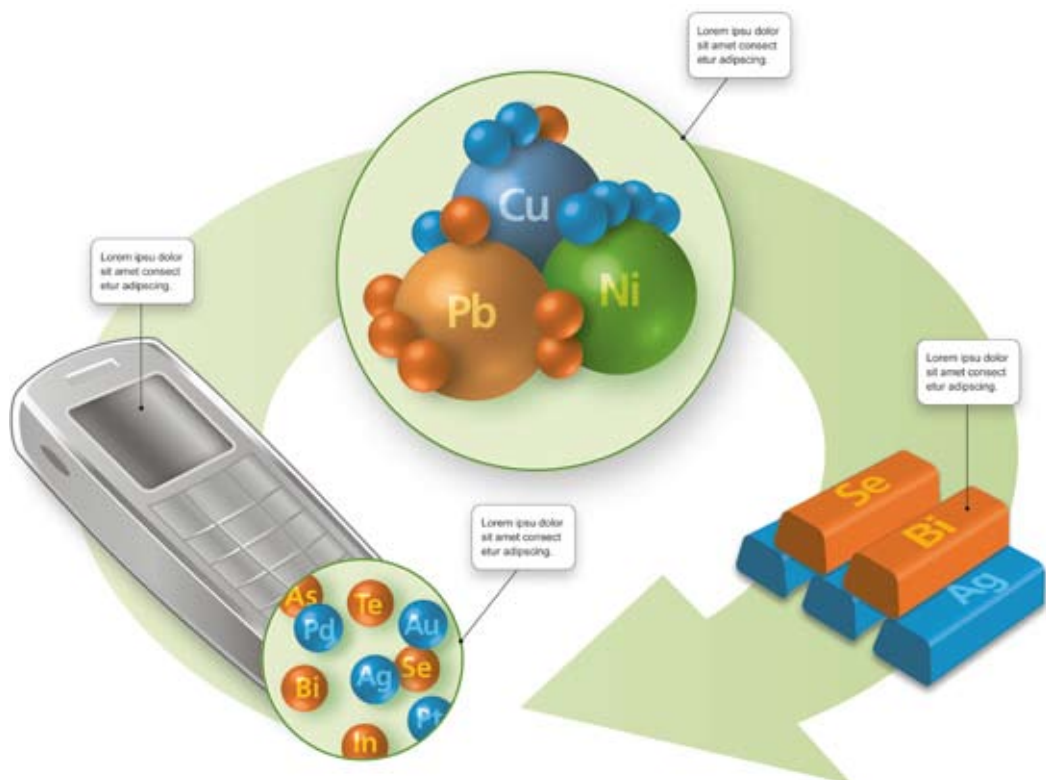
Umicore set up the world's biggest plant for the recycling of precious metals and has invested about € 250 million in the past ten years. Our site is one of the most efficient worldwide and is able to recycle 17 metals, of which seven are precious metals.

Umicore is not a metals group: our strategy is not to produce as much metal as we can and ride the waves of the economic cycle. Umicore is a materials-technology group offering highly performing materials for high-end applications, using as little as possible of these scarce and expensive metals.

This strategy is reflected in our goal to continuously increase reusing materials in our production processes. It involves products which have reached the end of their life cycle or by products of other production processes.

Recycling is particularly important in the field of precious metals. Although precious metals are designed in such a way that they become increasingly efficient, the use of modern technology in everyday applications has exploded in recent years boosting the demand for precious metals, which are scarce by definition.

Meanwhile Umicore has become the world's leading recycler of precious metals: almost 100% of our inflow of precious metals originates from secondary materials.



Base metals like copper, nickel and lead are used to recover or 'collect' precious and other secondary metals as part of Hoboken's complex recycling and refining operation. Precious metals like palladium, platinum, rhodium gold or silver connect themselves to copper just like special metals like indium, bismuth, selenium or tellurium are found in conjunction with lead.

A platform for a sustainable future

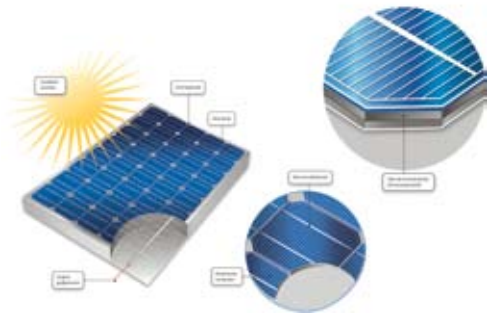
A sustainable future for our society requires dealing with our natural resources in a sensible way and finding innovative ways of providing clean energy.

Economic development can be compatible with taking care of our environment. Technological development and better knowledge of materials can allow us to minimize the inputs into products and maximizing so-called eco-efficiency.

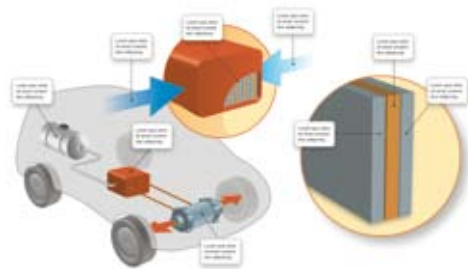
Umicore (...) is well-placed to supply today's society, and that of the future with innovative materials which help improve our quality of life while causing as little damage as possible to the environment. We do this by harnessing our unique experience and expertise in combining materials science, chemistry and metallurgy.

Environmentally friendly fuel cells that power cleaner vehicles; solar panels that provide our energy needs, miniature electronic gadgets that use powerful and light-weight rechargeable batteries; metals that can be almost infinitely recycled ... Umicore helps to make all these things a reality ... We truly provide

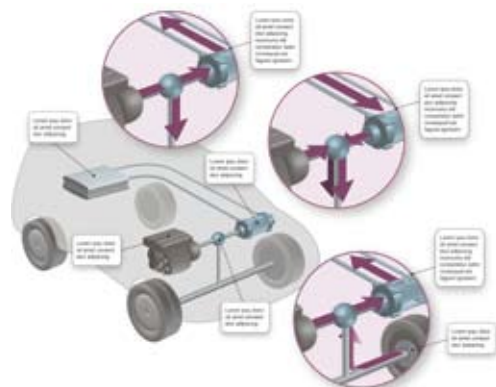
“Materials for a better life”



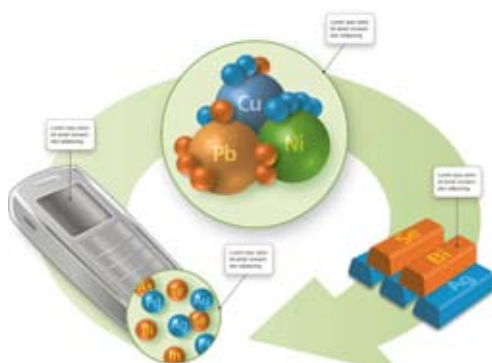
Solar cells



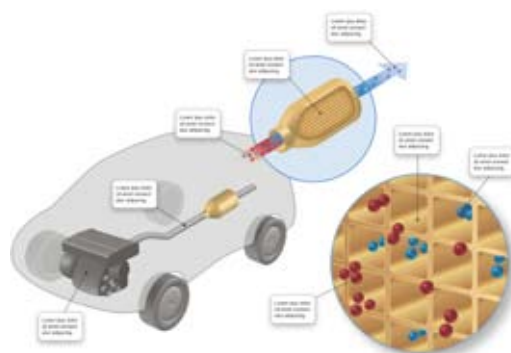
Fuel cells



Rechargeable batteries



Recycling



Automotive catalysts

The Umicore Way^(*)

What we believe?

We believe that materials have been a key element in furthering the progress of mankind, that they are at the core of today's life and will continue to be enablers for future wealth creation.

We believe that metal related materials have a vital role, as they can be efficiently and infinitely recycled, which makes them the basis for sustainable products and services.

We want Umicore to be a leader in providing and creating material based solutions which contribute to improvements in the quality of life.

We are committed to the growth of our business through the competence of our people, excellence in operations and technological innovation.

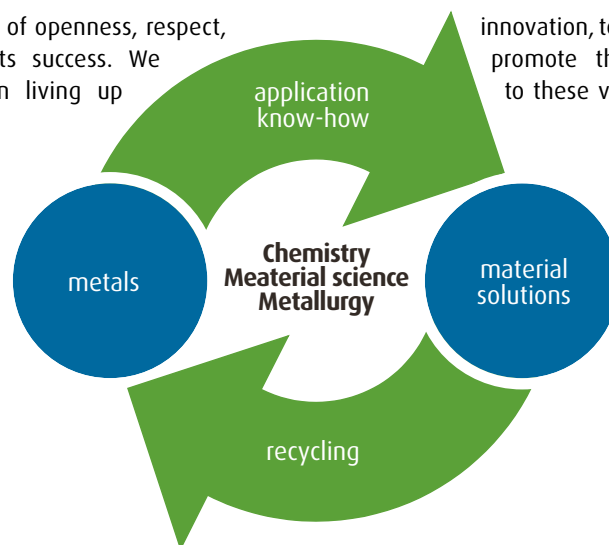
We recognize that our commitment to financial success must also take into account the broader economic, environmental and social impact of our operations.

We subscribe to the following principles in our pursuit of sustainable development:

- We integrate sustainable development considerations within the corporate decision-making process.
- We implement risk management strategies based on valid data and sound science.
- We seek continual improvement of our environmental performance.
- We actively participate in the management and remediation of risks that are the result of historical operations.
- We facilitate and encourage responsible design, use, re-use, recycling and disposal of our products.
- We engage with our stakeholders and implement effective and transparent communication and independently verified reporting arrangements.
- We strive to be a preferred employer of both current and potential employees.
- We uphold fundamental human rights and respect those rights in conducting the Group's operations throughout the world.

We hold the values of openness, respect, to be crucial to its success. We that deficiencies in living up appropriate way.

innovation, teamwork and commitment promote these values and ensure to these values are addressed in an



The Umicore approach to materials technology

(*) Umicore several years wrote down its corporate philosophy and strategic vision in a document entitled "The Umicore Way". Umicore applies the values and principles of sustainable development to the way it operates as a company. It has set itself a range of ambitious social and environmental targets on which its reports in its "Report to shareholders and society", its annual report integrating its economic, social and environmental performance in one single document.

Umicore worldwide operates almost 90 production site, employing more than 17 000 people on all continents. The Group is constantly looking for new talent to help grow Umicore (job profiles ranging from specialists in the field of materials, chemists, engineers, economists, computer experts, technical and administrative employees and operators). Are you interested? Please check out our website www.umicore.jobs for more information.

Umicore

Hoofdkantoor

Broekstraat 31 rue du Marais
B-1000 • Brussel, België

Telefoon: +32 (0)2 22 77 111
Fax: + 32 (0)2 22 77 903

www.umicore.com
info@umicore.com

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