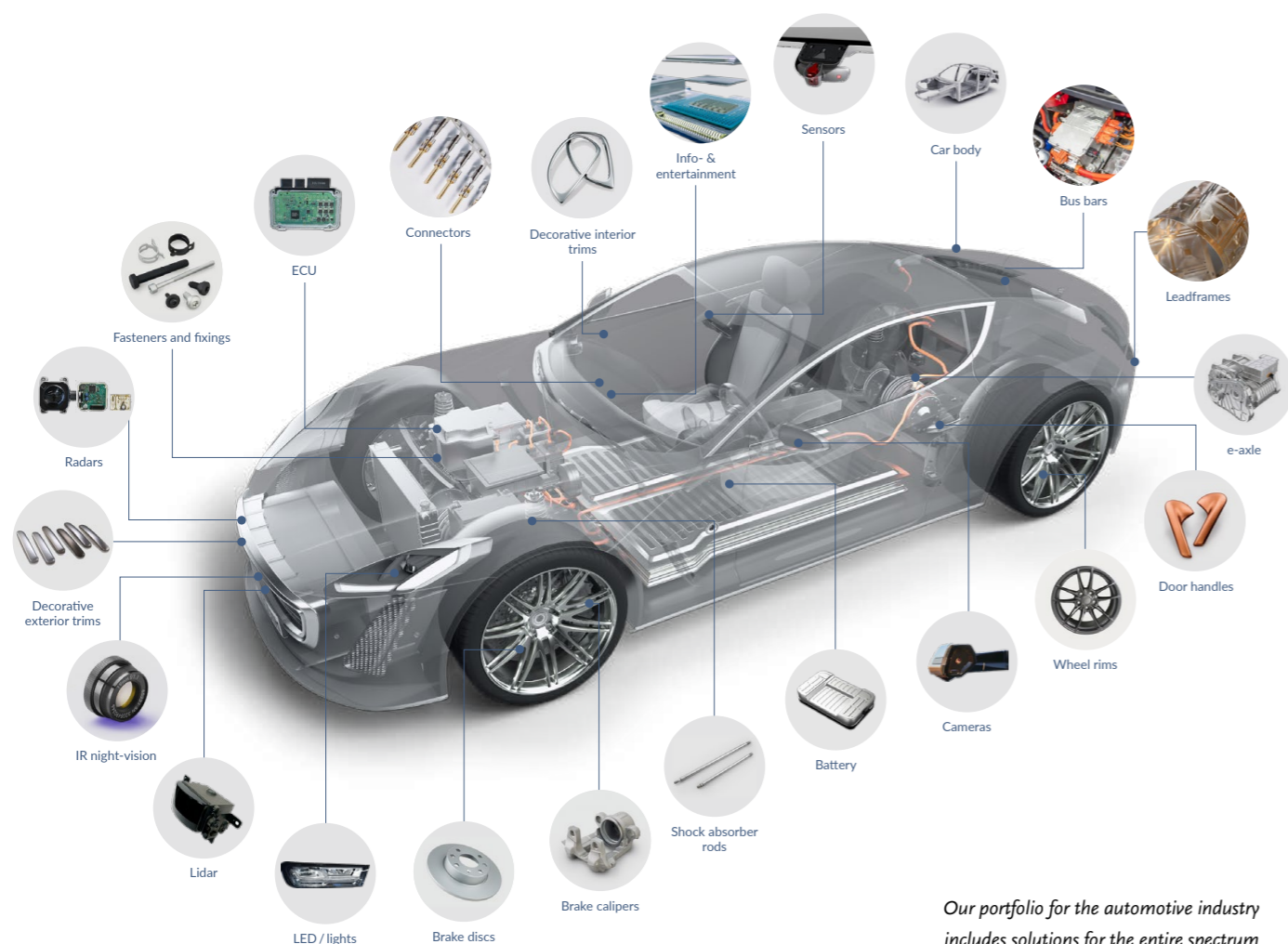


Hexavalent chromium-free Atotech technologies: advancing sustainability

With global demand for sustainable, low-carbon technologies and chemicals rising, MKS Instruments is striving to minimize the environmental impact of its products and technologies while continuing to meet industry demands. With a focus on water and energy conservation, waste reduction, and the development of toxic-free alternatives, MKS' innovative Atotech solutions are transforming the plating industry.

A hexavalent chromium-free future

One challenge facing the plating industry is hexavalent chromium, a widely used hazardous substance posing serious health and environmental risks. In response to chemical regulations and sustainability concerns, MKS has dedicated significant resources to developing alternatives. Its latest breakthrough, Covertron® 600, is a PFAS and chrome-free pretreatment process designed specifically for plastics.



Our portfolio for the automotive industry includes solutions for the entire spectrum of decorative and functional surface treatment for all drive technologies.

Performance and quality

Covertron® 600 is a tried-and-tested process that delivers performance and quality comparable to traditional hexavalent chromium. This innovative pretreatment process creates an etching pattern similar to hexavalent chromium by chemically attacking the plastic's surface in an acidic and oxidizing environment. Moreover, Covertron® 600 operates at far lower temperatures than conventional chromosulfuric etching, making it more energy-efficient. Though etching times may vary depending on the resin, molding, and complexity of the parts, the controlled etching mechanism achieves adhesion values even higher than existing technologies.

Versatility and integration

Covertron® 600 is compatible with various plastics – including ABS, ABS/PC – and selective plating materials, as well as high heat ABS (HH-ABS). It has proven its versatility by passing appearance, adhesion, and thermocycle requirements for all major Original Equipment Manufacturers (OEMs). The sustainable process seamlessly integrates into plating lines, allowing for easy adoption.

Expanding sustainable finishes: the TriChrome® series

In addition to Covertron® 600, MKS offers a broad range of hexavalent chromium-free finishes with its TriChrome® series. Its sustainable chrome finishes have a genuine „chrome look“ while also offering previously unattainable darker colors. The TriChrome® series ranges from very bright decorative chrome to dark grey finishes, with a neutral grey and very dark warm shades as its latest additions. These finishes are favored in automotive applications worldwide due to their excellent corrosion resistance.

Unparalleled benefits

Atotech TriChrome® also offers significant operational benefits. Compared to hexavalent chromium processes, the TriChrome® series increases productivity and improves plating results. The plating rate can be two to four times higher, requiring less current density. Interruptions, ripple effects, whitewash, and burnings are all eliminated, resulting in a more efficient, reliable plating process. The TriChrome® solutions can tolerate impurities in various ranges, simplifying maintenance. Additionally, specially developed Atotech ion-exchange equipment prolongs the solution bath life by removing unpleasant metallic contaminants.

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Quantifying sustainability through product lifecycle assessments

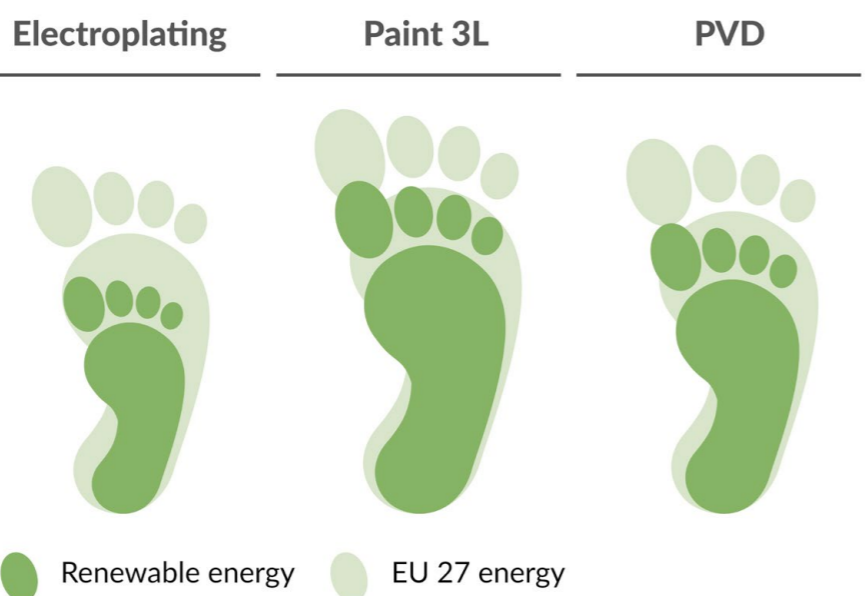
MKS's commitment to sustainability goes beyond product innovation, with product life cycle analyses and carbon footprint studies. These efforts are key to quantifying the environmental impact of operations and guiding decision-making towards sustainable practices. By implementing stringent sustainability frameworks across all markets for the Atotech brand, MKS strives for consistent, sustainable operations worldwide.

In a European pilot project, MKS engaged external specialists to gather accurate carbon footprint data (kg CO₂e) from cradle-to-gate on 160 Atotech decorative coatings and plating on plastics products. This comprehensive assessment analyzed the entire lifecycle of each part, evaluating factors like plating line operations, raw materials, products, and effluents.

Electroplating takes the lead in coating technology study

In addition to carbon footprint analysis, MKS conducted a detailed study of three prominent coating technologies for shiny metallic chrome or chrome-like surface finishes: electroplating, paint, and PVD (Physical Vapor Deposition).

The electroplating process, consisting of plastic pretreatment, plastic metalization, copper electroplating, multi-layer nickel coating, and decorative chrome electroplating, was the most environmentally friendly option. Notably, hexavalent chromium-free electroplating methods produced the lowest carbon footprints. The paint system, particularly in a 3-layer setup with water-based primer, water-based base, and solvent-based topcoat, had the highest carbon footprint of the three technologies.



Improving sustainability by reducing energy and material consumption

Energy consumption emerged as a major contributor to carbon footprints across all three technologies. Gas-powered ovens had a large impact in paint and PVD processes, as did rectifiers in electroplating. However, electroplating was revealed to have the highest potential for carbon footprint reduction via renewable energy resources – paving the way for more sustainable practices.

In terms of materials, electroplating showed significant potential for reducing consumption by incorporating recycled materials like copper, nickel, and palladium. In contrast, challenges with organic materials affected paint and PVD processes, creating higher carbon footprints. Volatile organic compounds (VOCs) also played a role in paint and PVD emissions, highlighting the need for careful management.

With OEMs driving global sustainability, MKS plays a vital role in industry-wide change by providing eco-friendly solutions. Combining carbon footprint analysis with the adoption of more environmentally friendly electroplating technologies brings us closer to achieving a more sustainable automotive industry.

About Atotech

Atotech, a brand within the Materials Solutions Division of MKS Instruments, develops leading process and manufacturing technologies for advanced surface modification, electroless and electrolytic plating, and surface finishing. Applying a comprehensive systems-and-solutions approach, the Atotech portfolio includes chemistry, equipment, software, and services for innovative and high-technology applications. These solutions are used in a wide variety of end-markets, including datacenter, consumer electronics and communications infrastructure, as well as in numerous industrial and consumer applications such as automotive, heavy machinery, and household appliances.

With its well-established innovative strength and industry-leading global TechCenter network, MKS delivers pioneering solutions through its Atotech brand – combined with unparalleled on-site support for customers worldwide. For more information, please visit us at atotech.com.

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