IONICS Ion Implantation, Plasma and Electroplating Solutions

Imagine a world with…

Superior Quality of Life

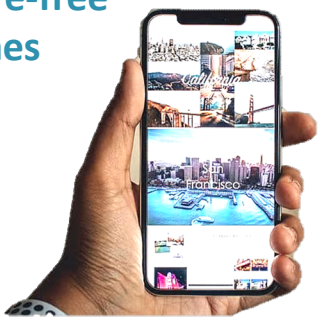
Biomedical Implants that last a Lifetime

No more Critical Materials

Dramatic material efficiency increases in durable goods and consumables

Exceptional User Experiences

Scratch- & glare-free smartphones



Super durable knives

Underlying Challenges

Increased Life Expectancy
Desire for Active Lifestyle
Surgery & Revalidations

Resource Depletion
Conflict Minerals
Geopolitical Tensions

Durability of Goods
Differentiation Challenges
Critical Twitter Generation

ionics surface technologies

Proposed Ionics Solutions

Increased Life Expectancy
Desire for Active Lifestyle
Surgery & Revalidations

Ion Implantation (*) creates super hard, durable and low friction implant interfaces that last a lifetime, eliminating repeat surgery and health complications at older age

Resource Depletion
Conflict Minerals
Geopolitical Tensions

The combination of Electroplating & Ion Implantation as well as specialty PVD (**) on powders strongly reduce the need for noble & conflict materials (gold, platinum,…) without loss of performance. These technologies substantially improve the wear rate of noble & conflict materials during use

Durability of Goods
Differentiation Challenges
Critical Twitter Generation

Ion Implantation, specialty PVD and plasma technologies bring disruptive functionalization to interfaces and surfaces of a diversity of consumer goods and technical consumables

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* Ion Implantation is the bombardment of materials with highly energetic ion particles to modify the surface

** Physical Vapour Deposition is a coating technology to vaporize materials that subsequently form very thin high performance coatings on substrates

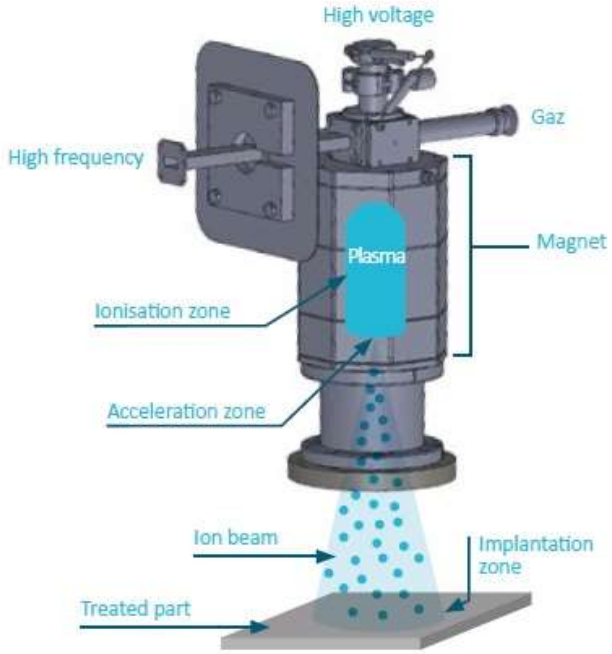
Ion Implantation – The Principle

In short, **Ion Implantation is the bombardment of materials with highly energetic ion particles**.

This highly energetic ion beam which penetrates and **modifies the surface** of materials to **enhance material properties without the use of any coating**; no physical coating means it can not chip off or break down.

The ion penetration depth might reach up to 10 microns and the treatment effects are still measurable until 1mm.

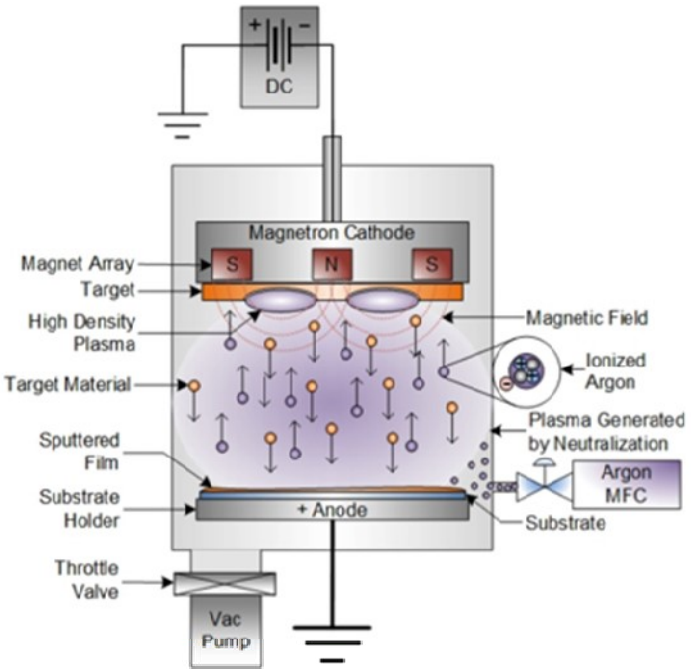
Ionics simplified and upscaled the Ion Implantation process (originating from electronics manufacturing) **in such a way that it became usable, cost-effective and robust for high volume industrial applications.**



Physical Vapor Deposition – The Principle

Within PVD, or physical vapor deposition, ionized particles are generated from a plasma. These positively charged ionized particles bombard (or “sputter”) a target material with high energy, thus instantly vaporizing the target material. This vaporized material then deposits on the substrate to be coated, thus creating a very thin film on the substrate.

Through its origins within Materia Nova, **Ionics has deep expertise in PVD coating application and equipment,** and **developed a unique PVD technology to bulk coat powders and small components**.



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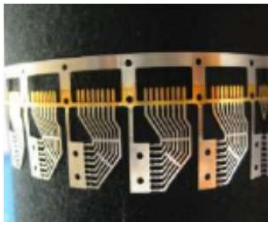
Ionics Industrial Surface Technologies

Electroplating

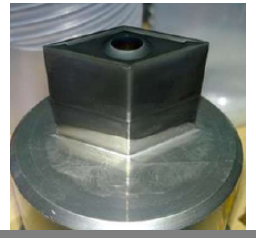
- Enhance corrosion resistance, wear & esthetics
- Drum, rack & reel-to-reel processes
- Plating metals with Cu, Ni, Ag, Au, Sn





PVD
PECVD
Plasma

- Surface coatings for many functionalities (hardness, COF, alloying…)
- Processed substrates include metals, ceramics, polymers…
- Processes to treat powders & objects
- Specialty coating systems


Ion Implantation

- Enhanced hardness, friction, wear & other properties
- Flat, powder & reel-to-reel (*) processes
- Modify metals, polymers, elastomers & other materials

* industrial-scale R2R currently under construction

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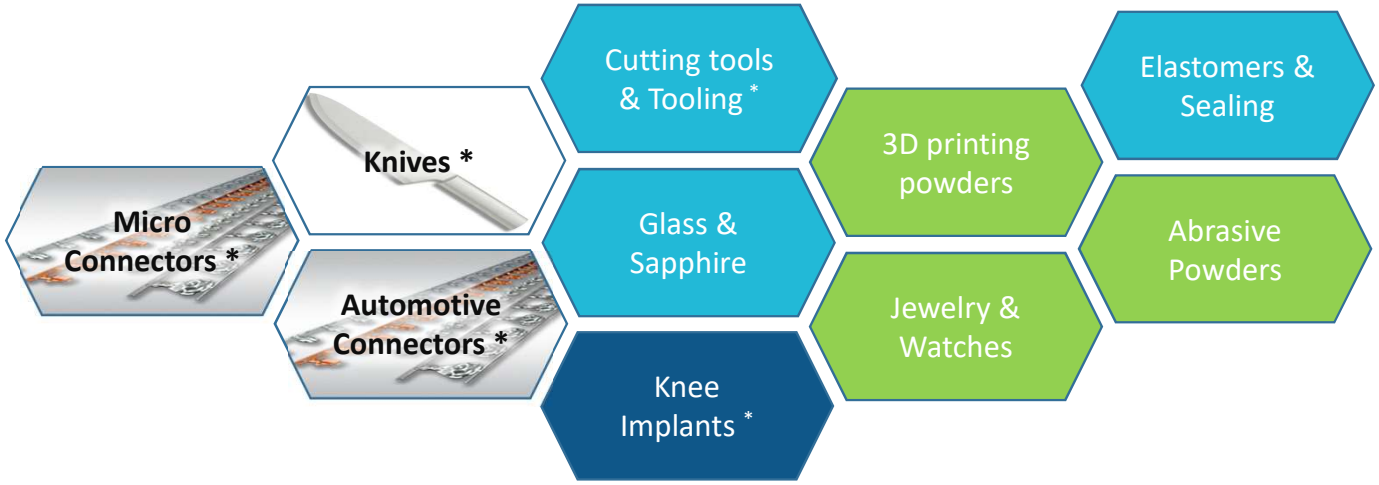
Ionics Business Model

	JOB COATING	MACHINE SALES	LICENSING
Electroplating	✓		
PVD PECVD Plasma	✓	✓	
Ion Implantation	✓	✓	✓

Ionics Competitive Advantage

	Competitors	IONICS differentiators
Electroplating	- Integrated companies (large groups) - Pure subcontractors	- Large flexibility (e.g. lead times & capacity) - Not just a job coater but a technical partner
P(EC)VD	- General-purpose esthetic & tooling PVD - Coating on tools, tooling & (larger) parts	- Only specialty PVD solutions for niche applications - Ionics can also treat very small parts & powders - Exceptional results when adding Ion Implantation
Plasma	- Cleaning & activation of simple surfaces - Preparation for glues or coating	- Highly technical niche applications, sensitive surfaces - Preparation for metals or ceramics deposition
Ion Implantation	- Electronics & medical - 1 surface treatment competitor, limited to pilot scale & single charge ions - Subcontracting (except for electronics)	- Many industries (automotive, knives, glass…) - Industrial scale, multi charge ion implantation: high throughput & superior surface treatment - Subcontracting, equipment development/sales and technology licensing

Market Development Roadmap



Underlying growth and business drivers

- Increasing pressure (scarcity, environmental, geopolitical) on use of ever more minerals, noble metals & rare earths
- Automotive electrification
- Strong growth in smart devices, IOT & cheap/disposable sensors
- Continuous drive towards higher performance to differentiate and stay competitive
- Increasing life expectancy; ageing demographics; lifelong health & active ageing

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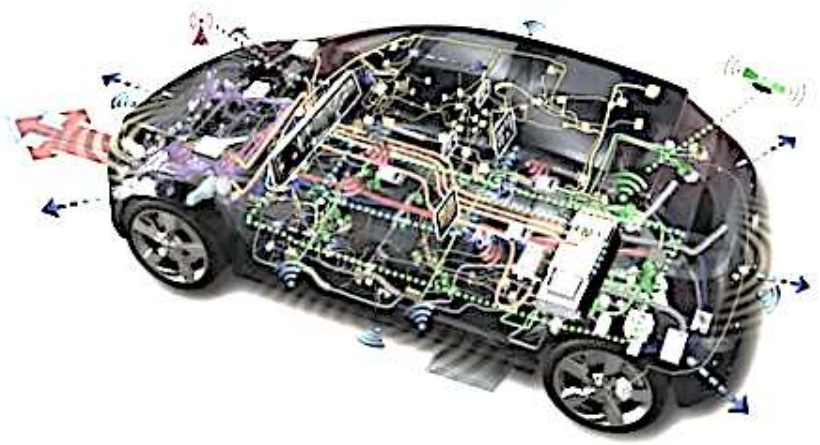
* Current focus

Automotive Connectors Case



[…The **automotive sector is another source of demand for GBW**. The industry is **shifting rapidly towards electrification** and autonomous driving and **gold remains the preferred metal for wire bonding**, as vehicle electronics have tight safety and reliability requirements, which tend to outweigh material cost considerations. Here therefore, gold demand is driven primarily by the increasing number of electronic control systems required to meet safety regulations, energy efficiency, emissions control, driving information, and driver assistance. **This trend is likely to continue for several years, prompting steady growth in the average gold loading per vehicle.** …] (*)

[…In 2015, the **entire fleet of cars in Europe** contained a total of **400 tonnes of gold**…] [… **The number of cars** that exited the fleet that year – being **scrapped** […] – accounted for **20 tonnes of gold**. (**)

Ionics developed and upscaled a patented industrial scale technology allowing a 50% reduction in gold use on gold plating applications without loss of performance, confirmed through automotive corrosion, conductivity & durability tests.

Assuming 20-40T/y of gold is used in new cars, this is an addressable market of **10-20 T/y, or 500M€-1B€/y of gold savings for the European car market alone.**

* www.gold.org/goldhub/research/gold-investor/gold-investor-july-2018/gold-and-the-electronics-sector

** https://www.deingenieur.nl/artikel/car-contains-a-lot-of-precious-metals

Powder Compression Tooling Case

	Untreated	IONICS Treated
Tooling lifetime	2.000 parts	12.000 parts
Cleaning cycle every	100 parts	500 parts

Powder compression tooling is used in several industries to shape technical parts and components from powders (e.g. ceramic powders). The abrasiveness and hardness of the powders used severely limits the lifetime of the tooling.

Ionics developed a dedicated proprietary coating system for industrial tooling that improves the lifetime by 600% and reduces the need for cleaning by a factor of 5.

Based on an industrial pilot case, **savings in tooling wear and improved productivity are estimated to be several 100M€ annually for Europe only**.

Equipment – Selection of Portfolio

PLAMECO
Batch PVD
Powder treatment

IonLAB
Batch Ion Impl.
40x40 cm bed

IonPOWDER
Batch Ion Impl.
Powder treatment

IonPRO
Double Batch Ion Impl.
1,8x1,6 m bed

IonR2R
Continuous Ion Impl.
Reel-to-reel

Expected Q4 2020

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Ionics Capital Needs 2020-2025

Currently, Ionics generates most revenues from its electroplating activities. It has the ambition to become the **leading provider of Ion Implantation and high end PVD technology solutions**.

For the period 2020-2025, **Ionics is raising 2,8 million €** in order to:

- Accelerate Ion Implantation & PVD business development efforts
- Construct a pilot line for reel-to-reel Ion Implantation
- Further technical development, application testing & validation
- Pre-finance equipment construction of initial equipment sales

Based on the validated business plan, **Ionics will generate sustained positive cash flows as of 2023**.

Ionics Team

ELECTROPLATING

LUC LANGER

CEO

MICHEL MARGRAFF

Business Development

JEAN-MARC DIERICKX

Operations Manager

ION IMPLANTATION & PLASMA

FABIAN RENAUX

R&D Manager

PERRINE LEROY

Business Development

LAURENT GERON

Operations Manager

In total, 27 people run Ionics on a daily basis!

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References & Credentials

Certified Automotive Supplier

CERTIFIED LR

IATF 16949:2016

A selection of our Customers

sonaca

SWATCH GROUP

STOCKO

AGC

VEKO technology
More than 50 years of quality

allinox
Customized Cookware

SLS FRANCE

FISKARS®

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Key Partnerships & Collaborations

Research

UMONS
Université de Mons

FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

Hochschule Esslingen
University of Applied Sciences

INSA

Applied R&D

MATERIA NOVA Materials R&D Center

Fraunhofer

Equipment Manufacturing

GRAUX

AGC Plasma Technology Solutions

HEUERMANN HF-Technik GmbH

Business development

the venturi tribe

robeko

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