Forme, matière, fonction : enjeux communs entre les composants médicaux et horlogers?

Heraeus Materials SA, Dr Vincent Dessenne
160 years of existence

1851
Chemist Wilhelm Carl Heraeus takes over his father's pharmacy, "Einhorn," in Hanau, Germany

1856
W. C. Heraeus melts two kilograms of platinum in oxyhydrogen gas flames for the first time, rendering the precious metal fit for industrial processing

2012
The Einhorn pharmacy has become a precious metals and technology group with global operations
Precious metal and technology group

- Precious Metals
- Materials and Technologies
- Sensors
- Biomaterials and Medical Products
- Dental Products
- Quartz Glass
- Specialty Light Sources

2011
- €4.8 billion in product revenue
- €21.3 billion in precious metals trading
- 13,300 employees
Global presence with 120+ locations
Active in key markets all over the world

- Steel Industry
- Dental Industry
- Semiconductor and Electronics Industry
- Medical Industry
- Photovoltaic Industry
- Automotive Industry
- Telecommunications Industry
- Mechanical Engineering Industry
- Chemical and Pharmaceutical Industry
- Glass and Ceramics Industry
- Specialty Light Sources Industry
Market leadership in niche markets

Keep the Group 100% family-owned

Sustain our solid financial performance

Through innovative products reinforce the competitiveness of our customers and grow in profitable niche markets worldwide

Be a market leader everywhere we do business (TOP 5)

Be an attractive employer for people who want to make a difference and can set things in motion
Innovation drives and secures our future

6’000+ patents

400+ employees in R&D

20% rate of innovation is what we strive for

25 development centers worldwide
Innovation: *there is always a better solution!*
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Vincent Dessenne | Heraeus Materials SA | 07.06.2012
So, are there common challenges between medical and watch components?
On shape, material, and function: the gecko

Millions de poils de quelques dizaines de microns

Milliards de poils de quelques centaines de nanomètres

Force d’attraction de Van der Waals entre moments dipolaires d’atomes
Medical components

- Wire Processing
- Plastic Molding
- Precious Metals Machining
- Coatings

- Crimp Sleeves
- Molded Insert Components
- Lead Connector Pins

- Ring Electrodes TIN/TrOx Coatings
- Shocking Electrodes
- Stranding
- Helix Electrodes
**Is material key to achieving function?**

We have been trying to develop a new tube made out of alloy X over the past 2 years, unsuccessfully; can you help us?

Yes sure, we have been dealing with this alloy for years, we need 8 weeks to deliver...

Great! Also I think we should develop alloy Y as this would certainly achieve my function better; we want to have better mechanical properties, it needs to be more radio-opaque, to bear improve biocompatibility and also to be MRI-compatible

Ok! What makes you think this particular alloy would achieve your function better? In our opinion, a better alloy could be developed; let me explain you why...
Is material key to achieving function?

- **Bio-compatibility**: Reduce risk of adverse body reaction
- **Strength**: Improve mechanical response, Reduce cross-section, Decrease invasiveness
- **X-ray visibility**: Improve visibility under image-guidance
- **MRI-compatibility**: Provide an option for MRI diagnostic
Is material key to achieving function?

Biocompatibility

MRI-compatibility

Strength

X-ray visibility

Legend removed CONFIDENTIAL

Picture blind CONFIDENTIAL

Picture blind CONFIDENTIAL

Picture blind CONFIDENTIAL
Is material key to achieving function?

Must be as diamagnetic as possible

Biocompatibility

MRI-compatibility

X-ray visibility

Strength

New Material

SS

CoCr

Nitinol
Is material key to achieving function?

Both the medical component and device manufacturers and watch makers are looking at the same charts and tables.

Watch parts:
- High resilience
- Cold-workable
- Fatigue life
- Amagnatic
- Athermic
- Corrosion-resistant

Picture blind
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Is material key to achieving function?

Example of medical application
Nano-coatings to increase surface, thereby increasing conductivity
How about precious metals?

MEDICAL

Biocompatibility
Radio-opacity
Conductivity
Pt, Pd, Au, Ir, Ag

WATCH

Colours
Image
Weight
Biocompatibility
How about refractory metals?

**E.g. Niobium**
- Lightning technology
- Scientific devices
- Anodization colors

**E.g. Tantalum**
- Pacemaker cases
- Condensators
- Laboratory equipment

**Many alloys!**
- E.g. Titanium
- Improving yield strength
- Improving tensile strength
So, is material key to achieving function?

YES!

As much for medical components as it is for watch parts
Precious metal cycle: a key to med and watch
Laboratory services: a tool to med and watch

SEM with EDX and GDX
Auger surface analysis
Metallography
XRD spectroscopy
Chemical analysis
Gas analysis
Impedance spectroscopy
Cyclovoltametric measurement
Mechanical and a wide range of ASTM testing

Building, testing, prototyping, analyzing and delivering components
Full range of analytical and testing technologies and expertise

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Quality: a must to med and watch

ISO 9001
Mainly dimensional and surface specifications
Visual inspection
Cosmetics
10 ea to 100'000 ea
Tolerances 0.1µ to microns

ISO 9001
ISO 13485
ISO-certified
Large array of customer specifications
Cleanrooms
Process control and capability
Online SPC
Complete traceability
Dock-to-stock
100 ea to 1’000’000 ea
Tolerances 0.5µ to microns

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So, which part would you like to see improve?
In a nutshell

There is always a better solution. Yet it requires innovation and a comprehension of the value chain from atoms to assembled components. Be that in a medical device to cure a brain aneurysm or in a watch.
Thank you for your attention!