# Des multicouches ultraminces et transparentes pour une protection longue durée

COAT-X

Experts in thin-film encapsulation

# The world's tightest biocompatible thin-film protective layers

**Dr. Andreas Hogg**
**CEO, Coat-X SA**

**www.coat-x.com**

Imagine a world where your iPhone is **longterm water proof**, or where copper or silver no longer corrode.

**That** is why we are here.

ASTT
Association Suisse de Traitement Thermique des Matériaux

COAT-X

# Current encapsulation solutions are not simultaneously…

**Waterproof** +

**Durable** +

**Ultra-thin** +

**Biocompatible**

## Wide range of possible applications

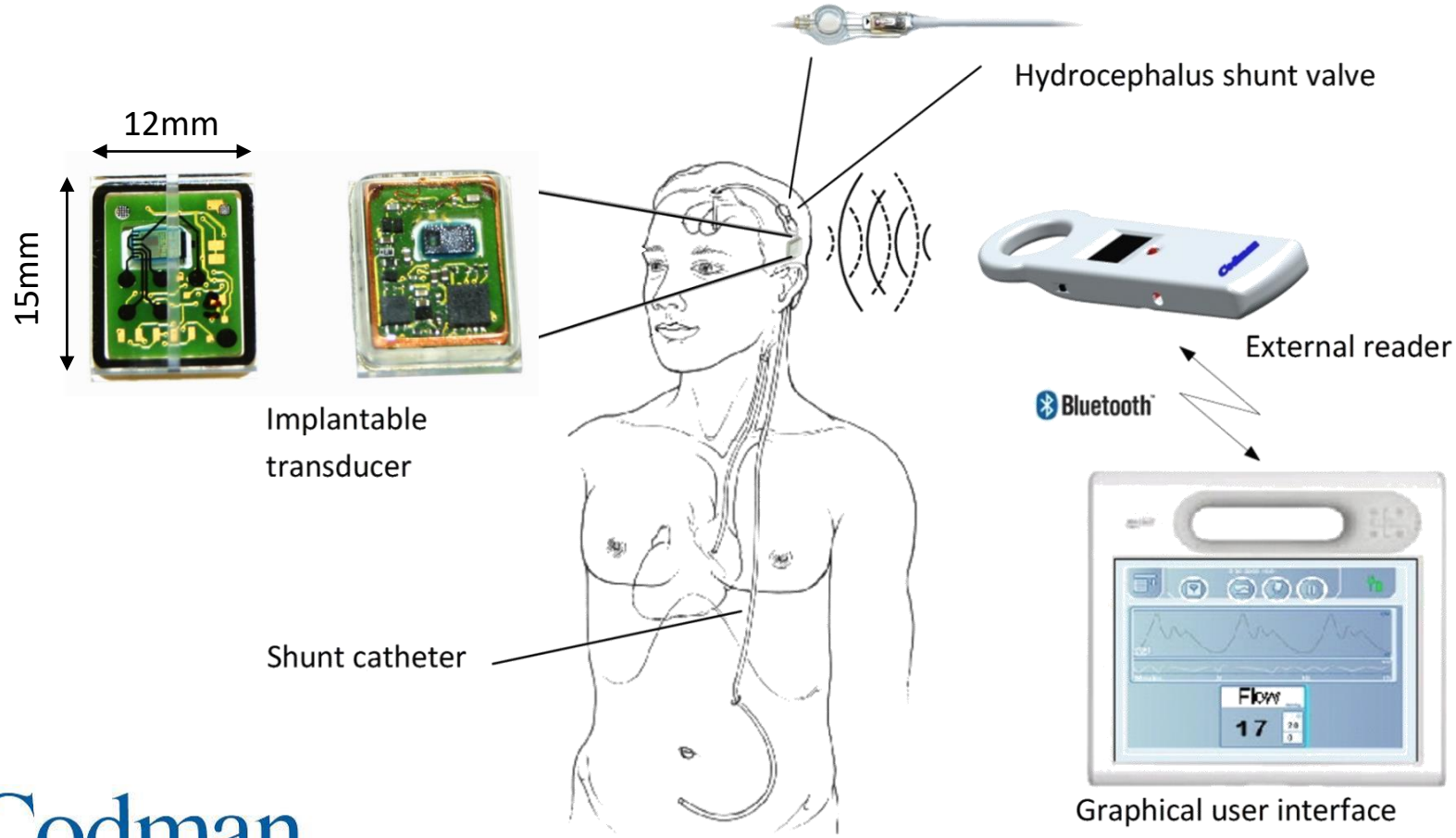
# Services and Products

**Coat-X is a leading solution provider for critical impermeability issues and expert in thin-film encapsulation.**

| | | |
|---|---|---|
| 1 | **Coating Services** | • Customized deposition services<br>• Scalable modular growth |
| 2 | **Validation Services** | • Hermeticity measurements<br>• Corrosion tests<br>• Accelerated aging tests |
| 3 | **Reactor Leasing** | • Tech licensing & reactor servicing ('Xerox' model) |
| 4 | **R&D Partnerships** | • Unlock new potential for strategic partners |

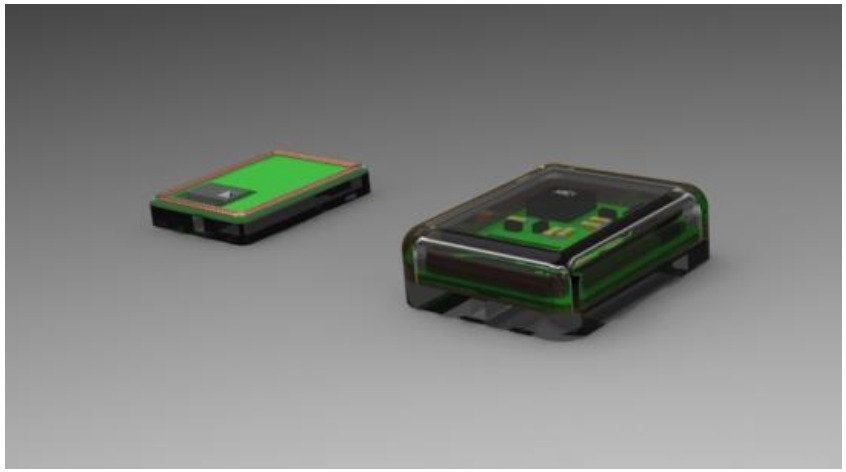
# How did it start?

***Developed flow sensor system for hydrocephalus treatment with bulk glass packaging***



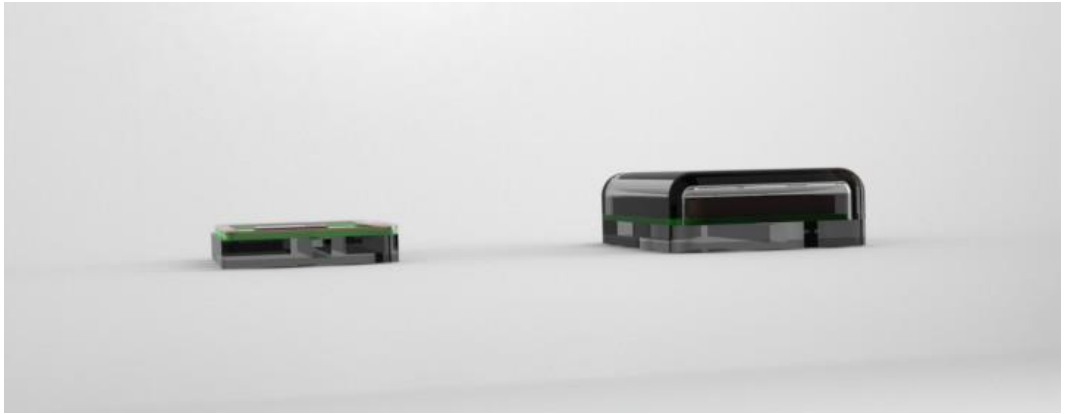

Codman
a Johnson & Johnson company

# Miniaturization by thin-film packaging



**Possible size reductions using multilayer packaging:**

| | |
|---|---|
| Height | **53%** |
| Length | **17%** |
| Width | **21%** |
| Volume | **70%** |



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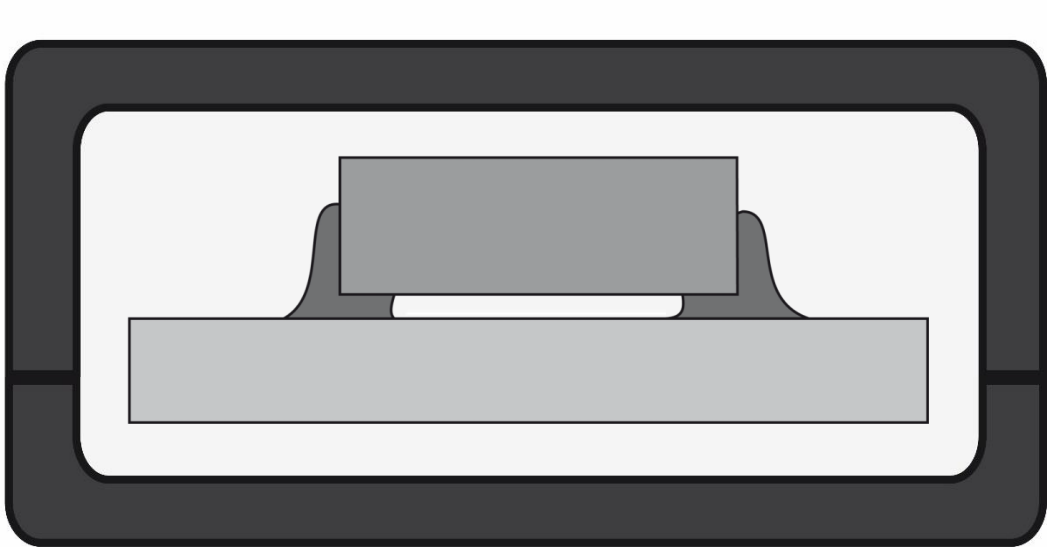
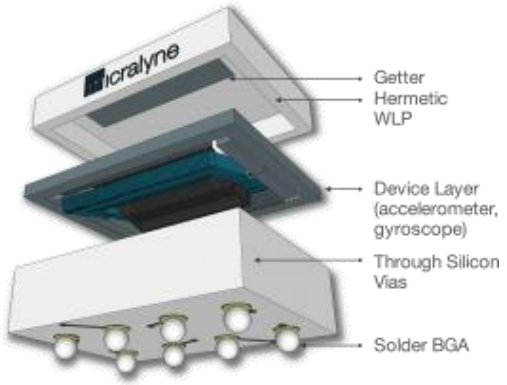
# The Problem

## *Today's packaging challenge*







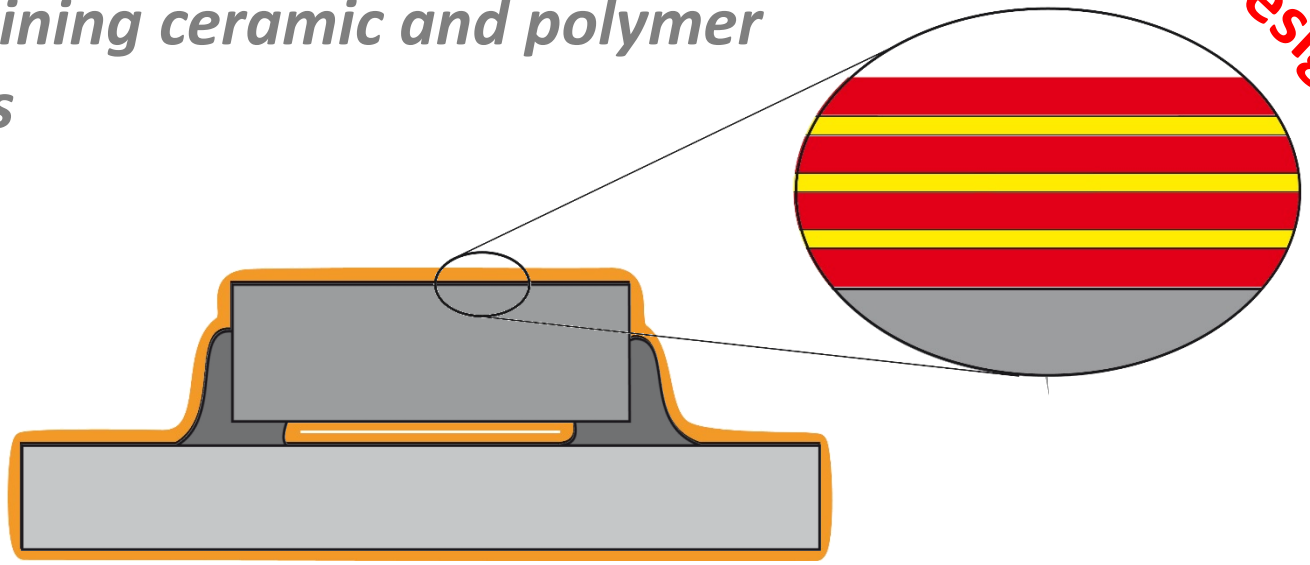
- *Limited miniaturisation*
- *Complex welding process*
- *Non-flexible package*
- *Cost intensive solution*


COAT-X
Multilayer Technology
proprietary technology and processes

# The Solution

Proprietary design & process

*Conformal multilayer packaging combining ceramic and polymer layers*



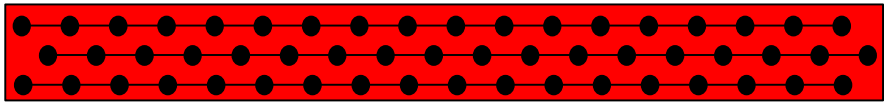
- *Significant miniaturization*
- *Deposition at room temperature*
- *Transparent / flexible*
- *Affordable cost*

*2'000 times more waterproof than Parylene !*

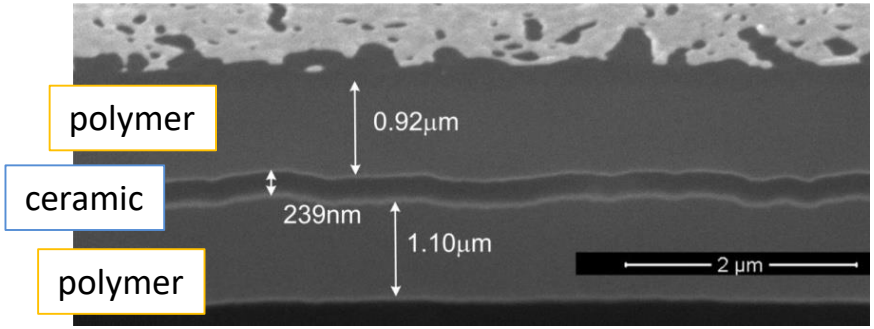
# Technology

## *Creation of close-to-ideal tight thin films*

**Polymer layers are growing pin-hole free and conformal. However they are not tight at molecular level.**



**Ceramic layers are tight at molecular level, however they grow under high stress resulting in pinholes and cracks.**



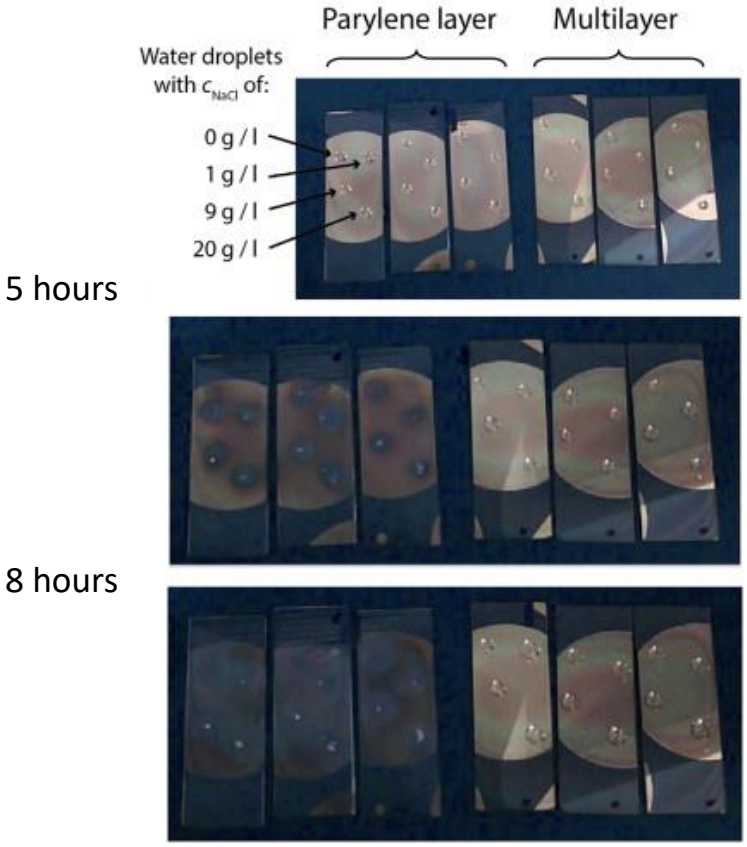

*Water Vapor Transmission Rate (WVTR) measured according ASTM F 1249*

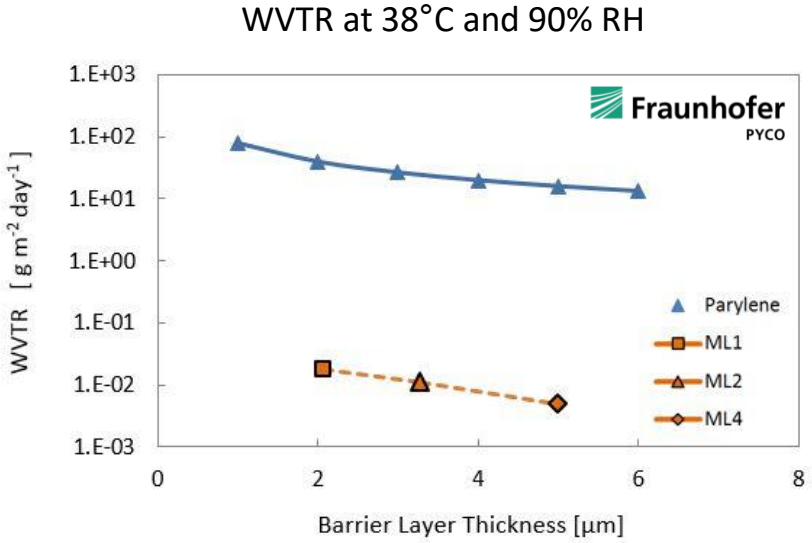
| **Materials** | **WVTR** [g um $m^{-2}$ $day^{-1}$] | **Improvement** |
|---|---|---|
| Silicone | 25000 | 625000 |
| Acrylic | 14000 | 350000 |
| Polyurethane | 1500 | 37500 |
| Epoxy | 950 | 23750 |
| Parylene N | 590 | 14750 |
| PET | 500 | 12500 |
| Parylene C | 80 | 2000 |
| Ceramic layer | 15 | 375 |
| **Multilayer** | **0.04** | **1** |

**A 10 µm Multilayer has the same protection performance than an epoxy layer of 2 cm and a silicone layer of 60 cm.**

# Performance

## *Water permeation measurements according ASTM F 1249*




The Calcium mirror test shows a WVTR of $4 \cdot 10^{-3}$ g/m$^2$/day for a 5 µm multilayer at 38°C and 90% RH (ASTM F 1249).

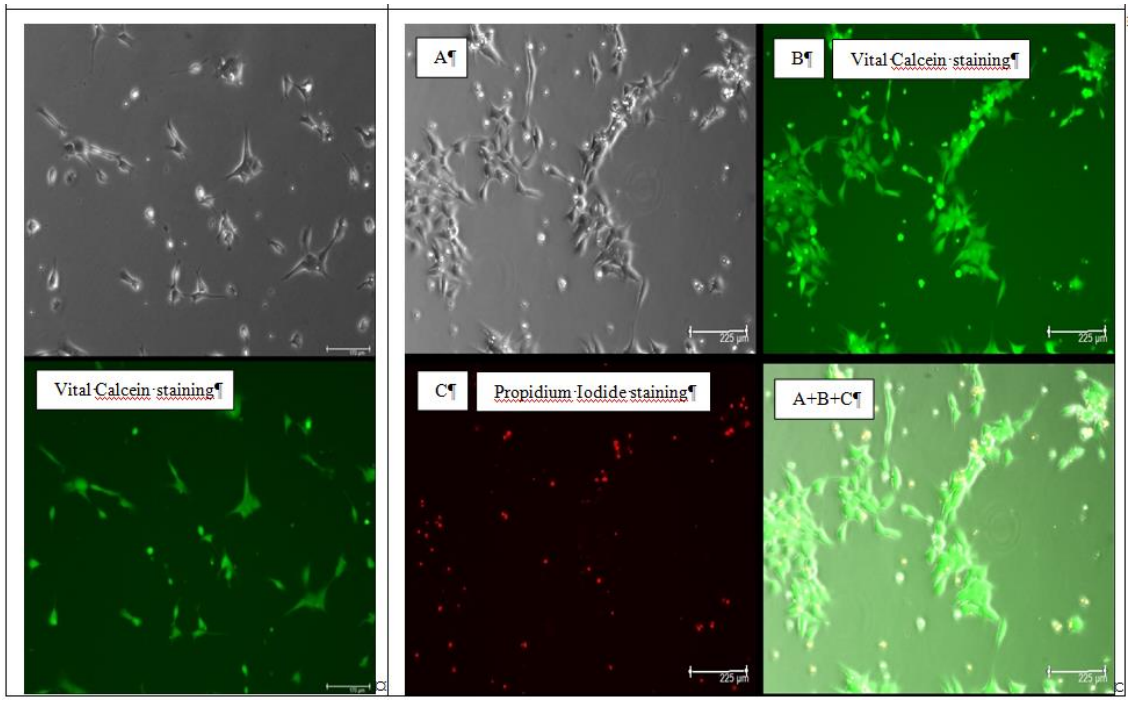
**2000 times better than conventional Parylene-C**

# Performance

## *Biocompatibility (cytotoxicity)*

### ReNCell cultures on multilayer (per ISO 10993-5)

hepia
Haute école du paysage, d'ingénierie et d'architecture de Genève




Control after 24h

Control after 72h

**Live/dead behavior and cell proliferation are comparable between coated samples and control samples.**

# Medical application

***Protection of rare earth metals (magnets) for long term implantation***

**Implant for glaucoma treatment**

# Watchmaking Sector

***Corrosion and aging protection of metals***

# Jewelry Sector

## *Silver protection*



# Jewelry Sector

## *Rose gold protection*


# Production Line

Installation of lean production line into clean room (ISO 5)


**Single chamber process**

**Ambient temperature**

**ESD compatibility**

**Fast deposition cycle 2h**

**Certification for Medical Devices ISO 13485:2016 in progress**

# Addressable Coat-X's Markets

- **Focus on PCBs, watchmaking and jewelry**

***PCBs***

***Watchmaking***


***Jewelry***

# Thank you for your attention