DATASHEET
°AirRay Electrodes

CorTec °AirRay electrodes based on the °AirRay electrode technology are capable of recording and stimulating brain activity. Produced in a proprietary laser manufacturing process, °AirRay electrodes are very soft, thin and flexible.

KEY WINNING FEATURES

High Precision
Ultra-short pulse laser micromachining allows for feature sizes of down to 25µm at highest reproducibility

Adaptation of Shape and Functionality
Modification of electrodes to build 3-dimensional assemblies as well as nerve cuff electrodes or integrating microfluidic channels for drug delivery

Easy Adjustment of Mechanical Properties
Varying the thickness of silicone, Parylene-C, or metal layers creates softer or harder electrode structures

Excellent Electrochemical Properties
Apart from Platinum-Iridium other materials are available upon request including high performance coatings or roughened structures for improving charge injection capacity

DESIGN OPTIONS

- Design geometry maximum: 90 mm x 90 mm
- Various designs for electrode outline incl. slit contours or intrafascicular designs
- Thickness: 0.08 mm – 1 mm

3D assembly

Multi-Layer Functionalization
- Adjustment of thickness (0.08 mm - 1 mm) and flexibility by number and type of polymer or metal layers
- Adaptation of contact density and functionality
- Functional components such as surgical mesh or suture material

Contact size: down to 0.04 mm

Surface treatment

Coating

Roughened surfaces

Contact shape: arbitrary

Fractal contact structures

Meandering contact patterns

contact spacing: down to 0.06 mm center-to-center (depending on number of contacts)

General Dimensions

CorTec adapts fabrication processes to meet the customer's requirements.
The two most typically used processes involve

- metal structures embedded in silicone rubber and
- metal structures sandwiched between a layer of silicone rubber and a layer of Parylene-C.

Closing Mechanisms
- Split cylinder | Buckle-and-belt
- Self-spiraling | Piano hinge

Further closing mechanisms for chronic implantation can be developed

Inner Diameter starting from 0.1 mm

Contacts
2-20 or more meander contacs made of PtIr, Platinum, IrOx, MP35N or other

Cuff length
starting from 1 mm up to several milimeters

PERFORMANCE

	Charge Injection Capacity	Typical Impedance[1] (Diameter 1 mm)		Typical Impedance[1] (Diameter 2.7 mm)	
		10 Hz	1 KHz	10 Hz	1 KHz
MP35N	max. 0.03 mC/cm² [4]	260 kΩ	5 kΩ	32 kΩ	0.6 kΩ
Platinum-Iridium (90/10)	0.06 mC/cm² [2]	47 kΩ	1 kΩ	8 kΩ	0.2 kΩ
Platinum	0.05 mC/cm² [3]				
Platinum Black	0.25 mC/cm² [5]				
Rough Platinum-Iridium (laser-treated)	0.27 mC/cm² [6]				
Sputtered Iridium Oxide Film (SIROF)	0.70 mC/cm² [7]				

1 Setup: three electrode configurations in 0.9% saline. Typical impedance readings.
2 Cogan et al.: In Vitro Comparison of the Charge-Injection Limits of Activated Iridium Oxide (AIROF) and Platinum-Iridium Microelectrodes, 2005.
3 Rose et al.: Electrical stimulation with Pt electrodes, 1990.
4 Ning et al.: Pitting Corrosion of High Strength Alloy Stimulation Electrodes under Dynamic Conditions, 1989.
5 Own investigations.
6 Own Investigations.
7 Own investigations, matching Cogan et al.: Sputtered iridium oxide films (SIROFs) for low-impedance neural stimulation and recording electrodes, 2004.

MATERIALS

POLYMERS

Medical grade silicone rubber
- Long-term (≥ 30 days)
- Short-term (< 30 days)

Parylene-C

METALS

Medical grade metal alloys:
- Platinum-Iridium (90/10)
- Platinum
- MP35N
- Stainless Steel
- Gold

High-performance coatings:
- Sputtered Iridium Oxide (SIROF)
- Platinum Black

Physical surface modification like laser roughening permits additional adaptations to the individual application.

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