

1. Executive Summary

Hexenon-M (Medical Grade) is a specialized carbon nanotube weave optimized for high-fidelity neural bridging and microscopic surgical threading. Unlike industrial carbon weaves, Hexenon-M undergoes a proprietary surface functionalization process to ensure 100% biocompatibility with human neural tissue.

2. Dimensional Precision

The primary advantage of Hexenon-M is its diameter-to-strength ratio. Standard surgical sutures (e.g., 10-0 Prolene) have a diameter of ~20-29 microns. Hexenon-M "Neuro-Threads" are manufactured at a standard diameter of 5.0 microns, allowing for integration directly into the fascicles of peripheral nerves without causing displacement trauma.

Table 1: Dimensional Comparison - Hexenon-M vs. Standard Micro-Sutures

Suture Type	Diameter (μm)	Tensile Strength (MPa)	Biocompatibility	Conductivity
10-0 Nylon	25.0	450	High	Non-conductive
11-0 Ethilon	15.0	500	High	Non-conductive
Hexenon-M Alpha	5.0	12000	Ultra-High	1.2 x 10^6 S/m
Hexenon-M Nano	1.2	15000	Ultra-High	1.5 x 10^6 S/m

3. Electrical Fidelity and Impedance

For neuro-linking applications, signal clarity is paramount. Hexenon-M exhibits a unique "Quantum Tunneling" effect at the synapse junction, reducing signal noise by 40% compared to platinum-iridium electrodes.

Table 2: Signal Impedance at 1kHz

Material	Impedance (kΩ)	Signal-to-Noise Ratio	Flex-Life (Cycles)
Platinum-Iridium	150	12:1	<10,000
Gold-Plated Copper	120	15:1	<5,000
Hexenon-M (Raw)	15	45:1	>1,000,000

4. Long-Term Tissue Integration

A major hurdle in neural implants is the Foreign Body Response (FBR). Standard implants trigger the formation of a glial scar that eventually insulates the electrode from the neuron. Hexenon-M's peptide coating prevents this response.

Table 3: Glial Scarring Thickness Over Time

Duration	Platinum-Iridium (μm)	Hexenon-M (μm)	Signal Attenuation
1 Month	15	<1	-0.05 dB
6 Months	45	1.2	-0.10 dB
24 Months	120	1.5	-0.12 dB

## 5. Clinical Recovery Benchmarks

*In Phase II trials, Hexenon-M bridge grafts significantly reduced the time required for post-operative sensory feedback return.*

**Table 4: Recovery Timeline (Average Days)**

<i>Function Type</i>	<i>Standard Nerve Graft</i>	<i>Hexenon-M Bridge</i>	<i>Improvement</i>
<i>Pain/Temperature</i>	<i>180 Days</i>	<i>42 Days</i>	<i>76.6%</i>
<i>Proprioception</i>	<i>240 Days</i>	<i>60 Days</i>	<i>75.0%</i>
<i>Fine Motor Control</i>	<i>365+ Days</i>	<i>120 Days</i>	<i>67.1%</i>

## 6. Sterilization and Regulatory

*Hexenon-M is classified as a Class III Implantable Medical Device (ISO 10993).*

**Table 5: Sterilization Limits**

<i>Agent/Process</i>	<i>Resistance</i>	<i>Max Temp</i>	<i>Repeatability</i>
<i>Steam Autoclave</i>	<i>Excellent</i>	<i>142°C</i>	<i>500+ Cycles</i>
<i>Ethylene Oxide</i>	<i>Excellent</i>	<i>60°C</i>	<i>Unlimited</i>
<i>Gamma Radiation</i>	<i>Good</i>	<i>N/A</i>	<i>1 Cycle</i>

## 7. Surgical Workflow and Safety

*Implementation requires the specialized "Nanoworks Surgical Kit" to prevent static charge interference.*

**Safety Note:** *Surgeons must use bipolar cautery at least 2cm away from the graft site. Hexenon-M is permanently conductive and can act as a thermal conduit if misused.*

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