

# Medical Devices

Medical device manufacturers utilize coatings to enhance various desired properties. Prolonged contact with body tissue and corrosive body fluids, for example, require a coating with enhanced biocompatibility, inertness and bio-stability. Electrical surgical devices can benefit from an insulating coating that can withstand high temperatures and higher energy delivery.

Forge Nano has been providing cost-effective solutions to medical device manufacturers by taking advantage of the unique properties of ALD-Cap<sup>®</sup>. As a ceramic coating it is inherently inert and stable to temperatures as high 1000 °C and has been tested to have excellent biocompatibility.

The exceptional barrier properties of ALD-Cap<sup>®</sup> are ideally suitable for the most demanding medical applications. As a comparison, ALD-Cap<sup>®</sup> is more than  $\times 10^7$  less permeable to gas and water vapor than parylene, as well other polymer conformal coatings.

ALD-Cap<sup>®</sup> coatings are flexible and can be deposited on flexible plastic substrates at low temperatures. The superior conformal coverage of atomic layer deposition guarantees they will conform to any substrate form.

Forge Nano has also developed polymer-based ALD coatings that can provide additional benefits to your design needs. Please contact us for more information.

## Advantages and Benefits:

- Biocompatible
- Inert
- Stable to 1000°C
- Flexible pure ceramic films
- Superior corrosion protection
- Extremely low permeability barrier to gases and fluids
- Superior uniformity (typical <1% over 4")
- Thin coating (200-500 nm)
- Straightforward masking
- Low temperature deposition (down to 70° C)

- 100% conformal
- High dielectric strength (8-10 MV/cm)
- Atomic level control of film properties
- Seamless Incorporation of nanolaminates

## About Forge Nano

Forge Nano is a leading materials science company harnessing the power of Atomic Armor, the company's proprietary ALD nanocoating technology, to accelerate manufacturing innovation, transform product performance and achieve a more sustainable future for a range of industries around the world. Atomic Armor produces superior coatings that can unlock a material's performance at the atomic level and deliver custom solutions from small-scale R&D and laboratory work to large-scale, high-volume production lines. A range of materials can be enhanced through Atomic Armor, including batteries, medical devices, catalysts, propellants and 3D additives. Forge Nano has received major support and signed meaningful partnerships with Volkswagen, LG Technology Ventures, Mitsui Kinzoku, Air Liquide and Sumitomo Corporation of Americas, largely as a result of the company's innovation in the Lithium-ion battery industry and successful track record of improving product performance and safety while reducing cost.

## Forge Nano's Capabilities

- >20 in-house ALD systems for coating of wafers, powders and objects
  - Including research, pilot and commercial scale systems capable of processing anywhere from 1.0 g to 30,000 kg powder or extrudates per day
  - Fast deposition times up to 30 nm per minute for rapid Al<sub>2</sub>O<sub>3</sub> ALD coating solutions at all-in costs of ~\$1 per 300 mm wafer
- The world's most knowledgeable and experienced team for ALD onto a range of materials
  - PhD scientists, certified Professional Engineers, career scientists
  - 20+ years' experience designing and building powder ALD systems

## Working with Forge Nano

Forge Nano assists customers daily with both R&D and commercialization of ALD-enabled materials. For R&D, we offer research services for proofs of concept and also sell our R&D equipment globally. For commercialization, we offer joint development of products, production equipment and IP licensing.