



CHROMING AND ELECTRO-DEPOSITION

About Us

NMPI brings more than 40 years of research and development in materials science to our coating technology. Our concepts are supported by extensive university level research, published and reviewed results and the successful development of commercial and military applications.

NMPI manufactures detonation synthesis nanodiamond (“DSND” or ultra-dispersed diamond). We engineer DSND for specific applications by manipulating their properties both in the process of creation and post-creation. Our DSND generally have an initial crystal size of 2-10 nm and may be applied as graphene coated, without graphene coat or mixed.

NMPI offers its customers unique opportunities to exploit a significant trove of intellectual property and R&D resources to obtain strategic advantage and competitive edge. Deliverables may include nanomaterials with custom applications, problem solving with nanomaterials, licensing of our intellectual property or consulting in materials science.

Custom Solutions

Introduction and capabilities

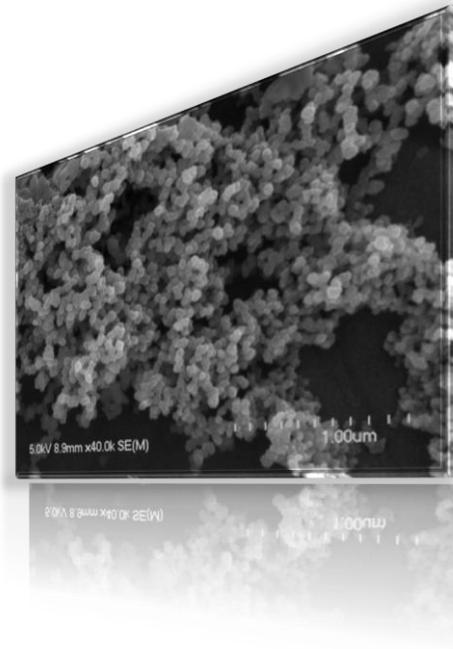
NMPI focuses on developing customized and optimized solutions that advance the state of the art in the application of materials science. NMPI can build on existing solutions, adding refinements that improve results. We begin with your problem definition. Typical areas involve tribology problems such as lubricity including chroming strategies, material strength, elasticity and durability. NMPI looks at existing processes and materials, hypothesizes various approaches, applying a variety of materials and processes, and creates the best overall solution.

Properties and Use of detonation ND

Detonation nano-diamonds, the *unique engineering material* delivered by NMPI, are 2-10 nm initial crystal size (agglomerated up to 50 nm) and are the optimal engineering material (i.e., building blocks). Typical, commercially available nano-diamonds are material size of 500 to 900 nm and larger. Detonation nanodiamonds deliver material enhancements at the nano-molecular level that are far beyond the capabilities of mechanically created materials. Characteristics include lubricity (continuous, smooth surface, in metallic application),

mechanical strength (hardest material known), potential enhancement of thermal conductivity, and smooth-round surface.

Detonation synthesis DSNDs are very stable carbon compounds within the stated size interval. Their surface has high activity due to the availability of functional groups upon which Detonation Synthesis Nanodiamonds are dependent for their properties.



Other materials

NMPI creates a custom plating solution using detonation nanodiamonds combined with base metals such as nickel, zinc, copper, chromium or tin or with noble metals including gold, platinum or silver to create an enhanced surface.

Nanodiamond Electrochemical Deposition¹

Introduction of hard, dispersed particles such as oxides, nitrides, borides, carbides, or natural diamonds into electroplated coatings increases their micro-hardness and wear resistance. This results from the reduction of size of deposited metal crystals and availability in the plating of a large quantity of super hard particles. The micro-particles deposited together with metal act as nuclei of crystallization. So the tinier the particle size, the more dispersed is the crystal structure of the plating. Micro-hardness (and wear resistance of the metal increases in proportion to $d^{-1/2}$ where “d” is crystal size.

¹ Electrochemical deposition is the overarching term used, replacing “chroming” which is a subset.

Electrochemical Deposition Test Bed



Plating, Chroming, Electro-deposition, Deposition without Encapsulation

Non-cosmetic, mechanical coatings using nano-molecular diamonds with a coating metal, custom developed and optimized for your product provide these benefits:

- Increased mechanical surface strength
- Increase surface lubricity
- Increase surface life
- Reduce or eliminate unfavorable reactions between fluids and base material
- Increased life for continuous stamping dies

Typical applications, high pressure, metal to metal applications that experience decreased hydrodynamic wedge lubrication:

- Machine tools
- Machine tool inserts
- Dental tools
- Bearings (rolling element or sleeve)
- Piston rings
- Gears
- Valves (tulip, reed)
- Weapons enhancement



General Technical Characteristics of Electrochemical Deposition

Micro-hardness of the plating, HV, kg/mm	1000-1400
Recommended plating width on the working detail surface, Micron	5-20
Increase of the service life of the part with plating (increase of deterioration resistance of friction cluster details and instrument stability)	2-15 X
Increase of adhesion to the base	30-40%
1kg of catalyst provides a deposition area @ 5 microns, Thousand m2	2.5-3.0

Creating a Custom Solution

Nanodiamond coatings require the correct environment for effectiveness. NMPI reviews your existing equipment, application and chroming solution. NMPI recommends changes needed for best results when using our nanodiamond enhancement.

NMPI can create a nanodiamond coated example of a part that you currently chrome or show you an example of parts that we have nanodiamond-chromed for others. Samples to be chromed must be less than fifty (50) pounds in weight and fit within our baths. When you decide to use NMPI nanodiamond chroming, an expert is available to provide consultation. For very large applications, on-site consultation is available. Consultation fees may apply.

For more information go to: www.nanompi.com

Contact: info@nanompi.com

Call: 248-529-3873