PYROHGEN

www.pyrohgen.com

INNOVATIVE GRAPHENE FOR THE FUTURE

We produce various allotropes of graphene for diverse applications using a patented manufacturing process that ensures ultra-pure, high-quality graphene at an affordable price.

UAE

Dubai, Deira, Al Masraf Tower, Baniyas Road, Suite 17-08

China

Chengdu, 中科微电子产业技术西南研究院孵化中心

Italy

Montecchio Maggiore (VI), Via 2 Giugno 6

USA

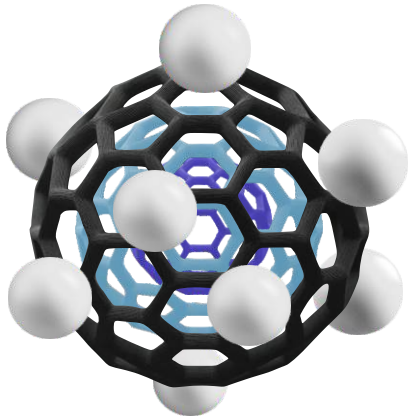
Miami, 4521 NE 5th Terrace, Oakland Park, FL, 33334

R&D office, Russia

Novosibirsk, AcademPark, Nikolaev street, 11

MASS GRAPHENE PRODUCTION

Our company specializes in producing various allotropic modifications of carbon and graphene, offering advanced materials that cater to a range of industrial applications.

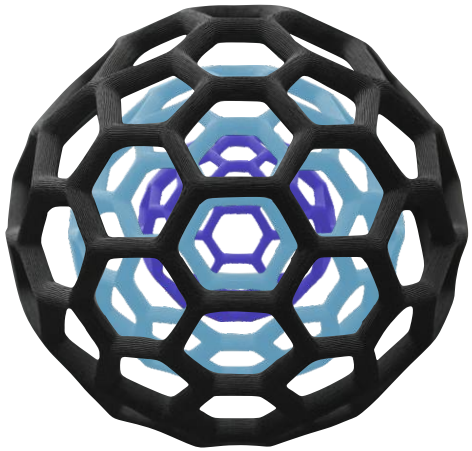


Nano-fluids

Oxidized form of carbon nano-onions

APPLICATIONS

- Coolants and thermal fluids
- Wear-resistant coatings
- Polymer composites
- Concrete

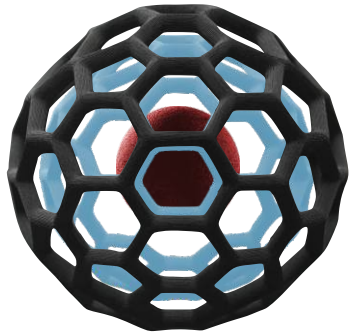


Carbon-nano onions

Black powder composed of particles ranging from 30 to 60 nm in size.

APPLICATIONS

- Ultralow-friction lubricants and additives
- Water purification
- Elastomers and resins
- Expoxy resins
- Tires



Core-shell structures

consisting of different metal / semimetal core wrapped in graphene layers **(Si@C, Ni@C etc.)**

APPLICATIONS

- Anode material for Li-ion batteries
- Oil recovery
- Catalysts in chemical reactions
- Sensors and detection systems

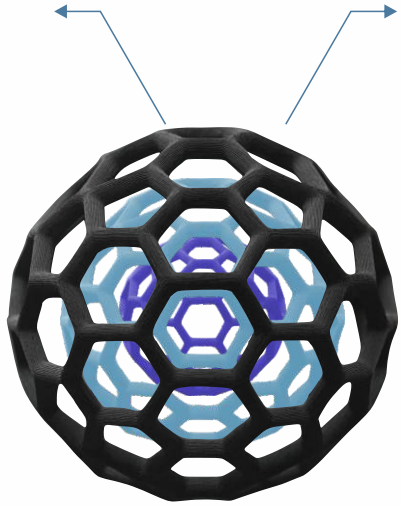
CARBON-NANO ONIONS

CNO consists of spherical and multilateral fullerenes close to each other. The distance between the graphitic layers is 0.335 nm, and it is approximately equal to the distance between two graphitic planes (0.334 nm).

Black powder, particle size 30 – 60 nm. The spherical nature of the material leads to a unique ability to be dispersed in a variety of solvents.

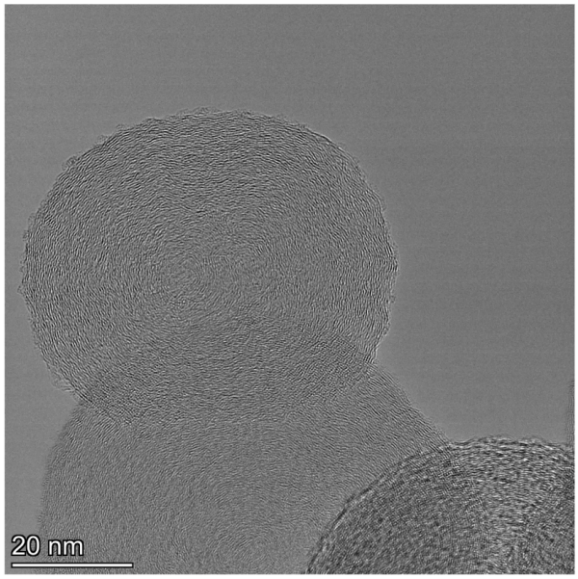
TYPICAL APPLICATIONS

- Ultralow-friction lubricants and additives
- Water purification
- Elastomers and resins
- Expoxy resins
- Tires



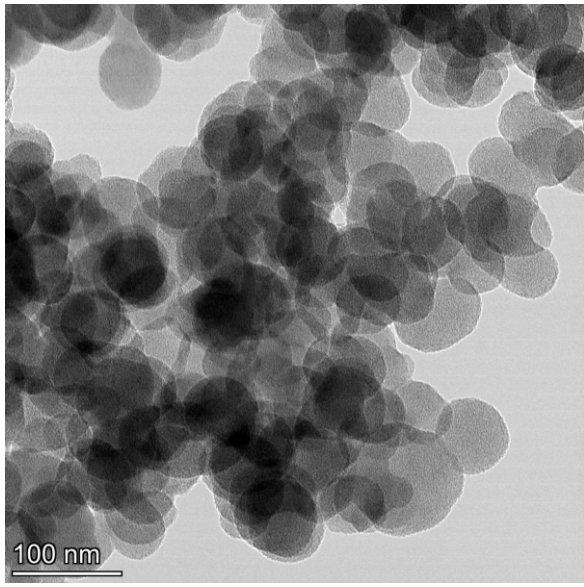
- **Particle size:** 30–60 nm
- **Number of shells:** 40–60
- **Specific surface area (BET):** 420 m^2/g
- **Electrical conductivity:** 2–4 S/cm
- **Bulk density:** 1.9 g/cm^3
- **Purity level (TGA):** ≥99.5%
- **Low defect rate**

- Possibility of chemical functionalization of the surface while maintaining the basic properties



CNO TEM

The spherical nature of the material leads to a unique ability to be dispersed in a variety of solvents.



ADDITIVES FOR AUTOMOTIVE OILS

Incorporating our CNO powder into your oil-based lubricants can transform their tribological properties, leading to enhanced efficiency, durability, and environmental compliance. Based on extensive research and testing:

Ultra-Low Friction & Wear

Reduces friction by up to 80% and wear by 2–10×. Forms a durable lubricating film that extends equipment lifespan.

High Load-Bearing Capacity

Spherical "nano-bearing" structure distributes pressure evenly, excelling under extreme metal-to-metal contact

Chemical Stability & Eco-Friendliness

Free of toxic elements, corrosion-resistant, and reliable in harsh environments. Compliant with REACH and EPA standards.

Synergistic & Versatile

Spherical "nano-bearing" structure distributes pressure evenly, excelling under extreme metal-to-metal contact

APPLICATIONS IN LUBRICANTS

Engine & Motor Oils: Cuts fuel consumption by 5–10% — perfect for automotive and heavy-duty engines.

High-Temp Greases: Performs reliably above 300°C in turbines, furnaces, and aerospace systems.

Industrial Lubricants: Boosts gear, hydraulic, and cutting oils — reducing wear, downtime, and maintenance.

Specialty Uses: Eco-safe for medical, food-grade, and space tech applications with strict toxicity limits.

GRAPHENE FOR WATER PURIFICATION

Carbon nano-onions are effective against various types of pollutants including heavy metals, organic compounds and oxo anions.

Wastewater treatment from heavy metals

The sorption capacity of CNO **for Pb^{2+}, Cu^{2+}, Cd^{2+}, Ni^{2+}, Zn^{2+} is 10 times higher than that of other forms of carbon**

Oxo-anions(MnO_4^-, CrO_4^{2-}, No_3^-)

Removal of permanganate ion (MnO_4^-) with an efficiency of 99.9% at a sorption capacity of 806.45 mg/g.

Organic pollutants

CNO effectively adsorb **pyridine** (36.81 mg/g), **dichloromethane** (90.95 mg/g), **aniline** (76 mg/g), **toluene** (64 mg/g), **chloroform** (36.25 mg/g), **methanol** (49.25 mg/g), **ethanol** (42.25 mg/g).

Petroleum products:

Gasoline (36.68 mg/g), **diesel** (58.1 mg/g).

APPLICATIONS

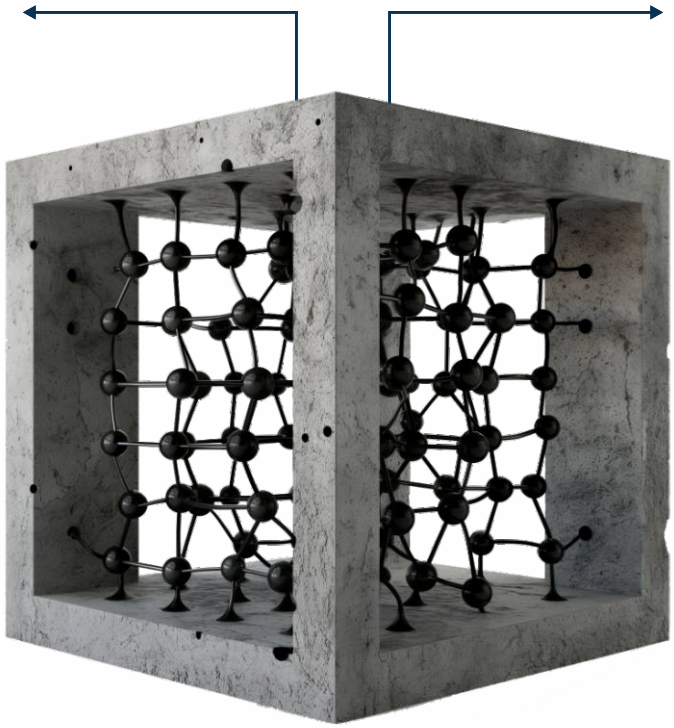
- **Industrial wastewater treatment**
- **Clean drinking water for every home**
- **Soil and groundwater recovery**

CONCRETE ADDITIVES

The use of graphene in concrete significantly improves its physical and mechanical properties. Here are the main advantages:

Increased strength: +46%

The addition of graphene increases the compressive strength of concrete by up to 146% and bending strength by up to 79.5% (depending on the concentration).



Microstructure improvement:

The addition of graphene promotes uniform hydration of cement, reduces porosity, and improves structural cohesion.

Reducing water permeability by 400%:

The permeability of concrete is reduced by 400%, which makes the material more resistant to moisture and aggressive environments.

Thermal stability:

Graphene increases the thermal conductivity and **heat capacity of concrete by 88%**, improving thermal protection.

ADDITIVES FOR ANTIFREEZE

Adding graphene to antifreeze improves thermal management and protection. Its high thermal conductivity ensures efficient heat transfer, better cooling, and prevents overheating. Graphene extends antifreeze life by maintaining integrity and reducing the need for replacements.

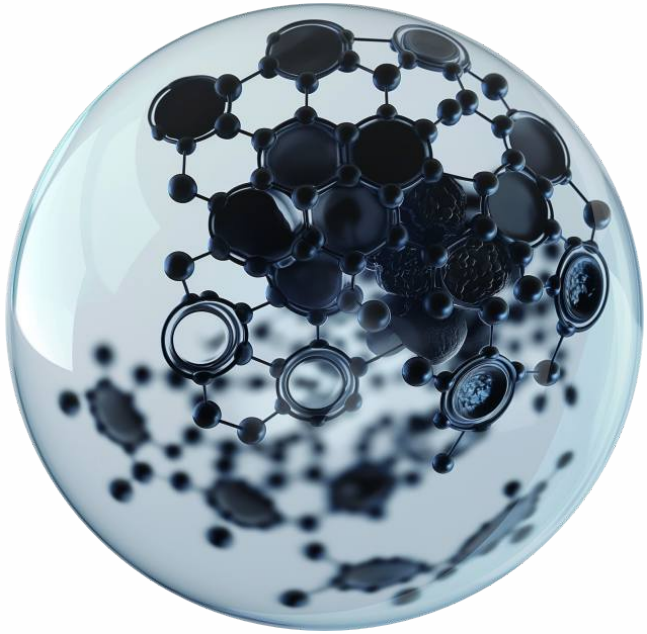
Key Benefits:

Enhanced Heat Transfer:

Graphene improves the thermal conductivity of antifreeze, allowing for better heat dissipation and efficient cooling of the engine.

Extended Service Life:

The robust properties of graphene additives help in maintaining the integrity of the cooling system, reducing the frequency of antifreeze replacement.



Anti-corrosive Properties:

Graphene additives provide a protective shield against corrosion, keeping the cooling system in top condition.

Eco-friendly:

Graphene-based antifreeze is more environmentally friendly due to its longer service life and reduced need for frequent changes.

GRAPHENE-ENHANCED PLASTIC

Graphene can be introduced into high-pressure polyethylene (HPPE) at various concentrations to create graphene-HPPE composites. **The recommended concentrations of graphene** for creating these composites are **0.25% - 5%**

Key Benefits:

Enhanced Mechanical Properties:

Graphene significantly improves the elastic modulus of HPPE, especially at concentrations of 3% wt and higher, leading to stiffer and more durable materials.

Improved Thermal Conductivity:

The high thermal conductivity of graphene enhances the heat dissipation properties of HPPE composites.

Increased Electrical Conductivity:

Graphene's excellent electrical conductivity is beneficial for applications requiring conductive materials.

Durable Building Materials:

Graphene-HPPE composites can be used in construction for durable and long-lasting building materials.

Typical applications

- Automotive Industry
- Aerospace Industry
- Electronics
- Construction

CORE-SHELL NANOSTRUCTURE

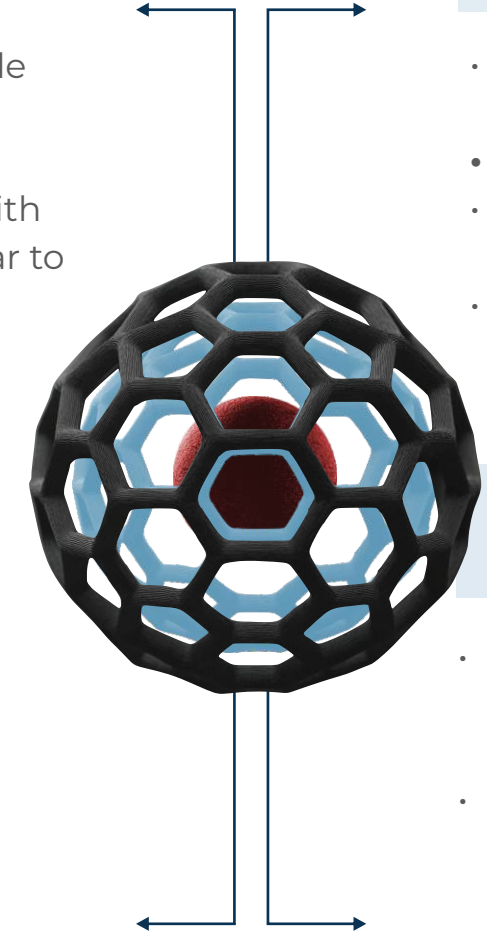
Core–shell structures based on carbon nano-onions (CNOs) are nanoparticles with a core (e.g., metal or carbide) encapsulated by concentric graphene layers, offering high stability, conductivity, and surface tunability.

Structure:

- **Core:** metal (Ni, Co, Fe), carbide (SiC), oxide etc.
- **Shell:** 5–70 concentric graphene layers with an interlayer spacing of ≈ 0.335 nm, similar to graphite.
- **Particle size:** 2 to 100 nm.

Application by Core Type

- **Si:** Nanofluids for enhanced oil recovery (EOR); Anode material for Li-ion batteries
- **Ni**:Catalysts for oxygen reduction reaction (ORR); Coatings for hard carbon films; Magnetic materials



Advantages of CNO-Based Core–Shell Structures

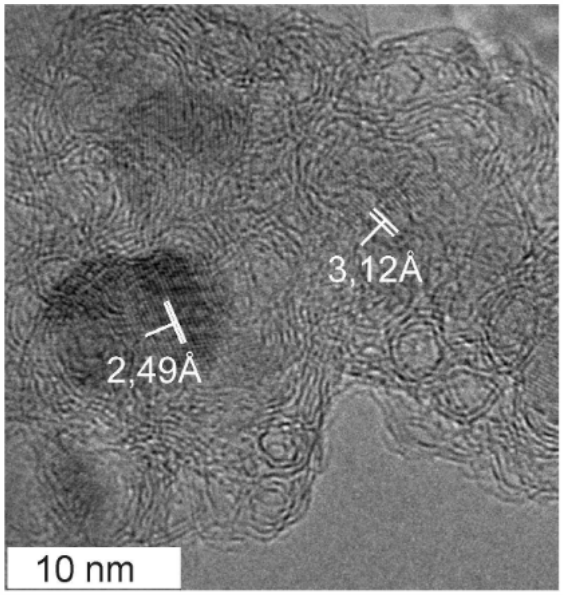
- **Core protection** against oxidation and agglomeration
- **Enhanced electrical and thermal conductivity**
- **Shell functionalization** through doping or surface modification
- **Catalytic activity** due to defect exposure in the shell

Application by Core Type

- **Co**:Highly efficient electrocatalysts for ORR and OER; Non-precious alternative to Pt in fuel cells
- **Fe, Sn, Pb, Au** :Catalysts in chemical reactions; Biomedical carriers (drug delivery, imaging contrast agents); Sensors and detection systems; Components in nanoelectronics

ANODE MATERIALS OF LITHIUM-ION BATTERIES

SI@C is designed for anode materials of lithium-ion batteries **to provide up to 10 times the capacity of Li-ion batteries.**



Key Benefits:

High Capacity:

Up to 10 times the capacity of traditional graphite anodes.

Durability:

Graphene shell prevents silicon core degradation during charge-discharge cycles.

Enhanced Conductivity:

Provides high electronic conductivity and a low diffusion barrier for improved efficiency.

Nanoparticle Design:

Silicon core coated with graphene layers, average particle size 50-60nm

Typical applications

- power supply for hybrid and electric vehicles;
- uninterruptible power supply systems;
- robotics and autonomous devices.

Description:

Black powder with a brown tint consists of a silicon core and a carbon shell (pure carbon, in allotropic form - graphene, small flakes), bulk density 30 mg/ml, average particle size ~50-60 nm.

CORE-SHELL FOR ENHANCED OIL RECOVERY & DISPLACEMENT

Graphene nanopowder enhances oil recovery by reducing interfacial tension and improving fluid flow. Its unique surface properties aid oil-water separation and boost extraction through pore-level interactions.

OIL EXTRACTION
+12-17% ↗

Key Benefits:

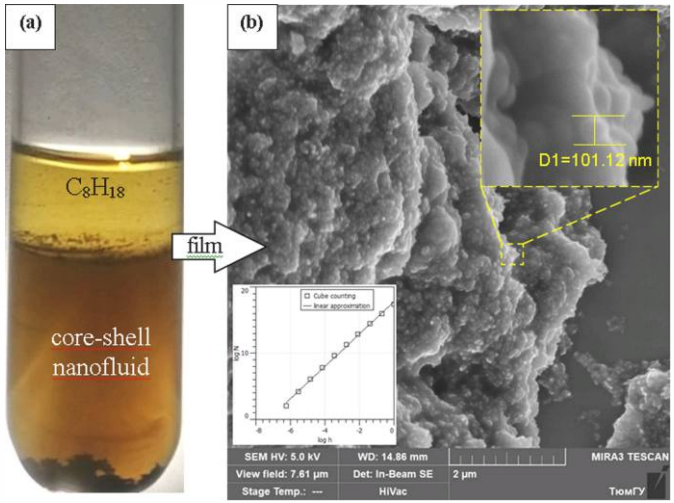
- **REDUCING OIL VISCOSITY WITH THE ADDING OF GRAPHENE NANOPARTICLES:**

  At low concentrations of graphene nanoparticles, **a decrease in the dynamic viscosity of the base fluid by 10%-17% is observed.**

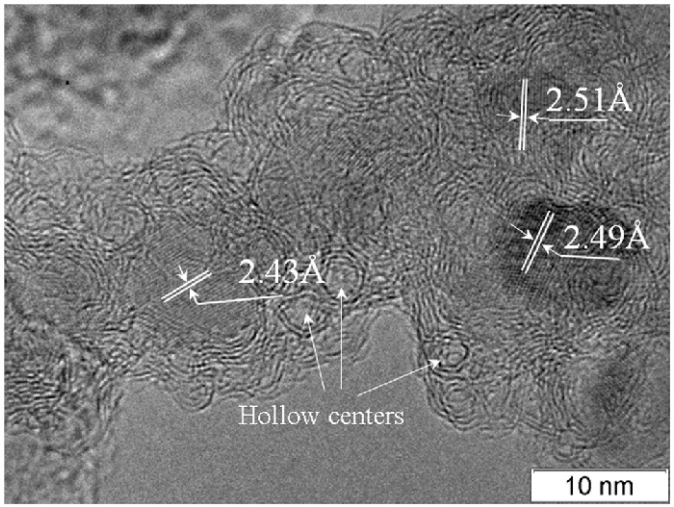
- **EXPERIMENTS CONDUCTED ON CORES SHOWED AN INCREASE IN OIL DISPLACEMENT OF MORE THAN 17%.**

  It was found that the maximum oil displacement rates are achieved with a combination of Core-shell structures with a silicon core and oxidized onion-shaped graphene.

- **CONCENTRATION:** 1 gram per ton of water



SEM image of a film on a silicon substrate



GRAPHENE NANO-FLUIDS

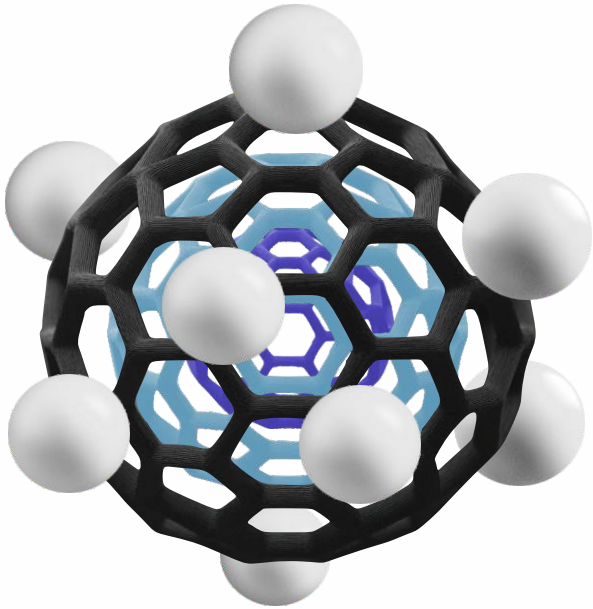
Oxidized form of carbon nano-onions

Concentration:
0.1–0.5% by mass

Specific heat:
+ 20–70% ↗

Viscosity:
+ 10–150% ↗

(depending on concentration)



Oxidation state
C/O ~ 4:1–6:1

Dispersion in water
(compared to unoxidized form)**:**
~70–90% ↗

Metalworking
reduces tool wear by 40–60% ↘

INTEGRATION METHODS FOR ONION-LIKE GRAPHENE IN CUTTING FLUIDS

Two main approaches are considered for integrating onion-like graphene into cutting fluids:

Nanofluids with Surfactants

Advantages:

- High dispersion stability and homogeneity when surfactants are well-chosen.
- Enables formulation customization for specific applications.

Limitations:

- Increased complexity and cost of preparation.
- Potential incompatibility between surfactants and cutting fluid or metal surfaces.
- Requires re-mixing after storage to maintain dispersion.

Nanofluids Based on Mildly Oxidized CNO (Without Surfactants)

Utilizes CNO with a moderate oxidation level (C:O ≈ 18:1).

Advantages:

- Achieves stable dispersion in mineral or semi-synthetic oils without the need for surfactants.
- Oxygen-containing functional groups (C=O, –OH, –COOH) improve wettability and adhesion to metal surfaces.
- Promotes the formation of a stable lubricating carbon film during operation.

Limitations:

- Oxidation level must be carefully controlled: over-oxidation reduces compatibility with oils.
- Excessively oxidized OLC may chemically react with cutting fluid components, compromising formulation stability.

COMPARISON WITH OTHER NANOSTRUCTURES

Property	CNO	Graphene Nanoplatelets	Carbon Nanotubes
Lubrication mechanism	Rolling + sliding, highly stable	Needs exfoliation during use	Degrade under pressure
Shape retention	Maintained post-friction	Often breaks into flakes	Easily flattened, amorphized
Anti-wear performance	Excellent, especially in graphitized form	Decent, reduced by aggregation	Variable, poor if structural failure
Effectiveness in cutting oils	High; boosts tool life and reduces wear	Limited by water/oil dispersion	Promising, but stability is an issue

Onion-like graphene combines structural stability, efficient lubrication, and eco-friendly composition. Unlike CNTs or nanoplatelets, it maintains performance under high loads without chemical transformation, offering:

- Superior tool protection
- Lower friction and wear
- Better dispersion in oil-based cutting fluids.

ONION-SHAPED GRAPHENE (CNO) APPLICATIONS LIST

PART 1: MASS MARKETS AND HEAVY INDUSTRY (LOW-HANGING FRUITS)

SECTION 1: CONSTRUCTION AND INFRASTRUCTURE
SECTION 2: LUBRICANTS AND AUTOMOTIVE CHEMICALS
SECTION 3: ENERGY AND BATTERIES
SECTION 4: POLYMERS, PLASTICS AND RUBBER
SECTION 5: OIL AND GAS AND ECOLOGY
SECTION 6: AGROINDUSTRY (AGRICULTURE)

PART 2: TRANSPORT, ELECTRONICS, CHEMICALS AND TEXTILES

SECTION 7: SHIPBUILDING AND MARINE TECHNOLOGY
SECTION 8: ELECTRONICS AND INSTRUMENTATION (MASS SECTOR)
SECTION 9: TEXTILE INDUSTRY AND WEARABLES
SECTION 10: CHEMICAL INDUSTRY AND CATALYSIS
SECTION 11: AVIATION AND SPACE (CIVIL SECTOR)
SECTION 12: PAPER AND PACKAGING INDUSTRY
SECTION 13: SPORTS EQUIPMENT AND HOBBIES
SECTION 14: TOOLS AND EQUIPMENT

PART 3: MEDICINE, DEFENSE, ECOLOGY AND HIGH TECHNOLOGIES

SECTION 15: BIOMEDICINE AND PHARMACEUTICS
SECTION 16: DEFENSE TECHNOLOGIES (DUAL-USE)
SECTION 17: ECOLOGY AND ENVIRONMENTAL CLEANING
SECTION 18: ADDITIVE TECHNOLOGIES (3D PRINTING)
SECTION 19: SENSORICS AND IoT (INTERNET OF THINGS)
SECTION 20: DEEP TECH
SECTION 21: MICROELECTRONICS AND OPTICS

PYROHGEN INNOVATIONS RESEARCH ON NATURAL SCIENCE L.L.C
UAE, Dubai, Deira, Al Masraf Tower, Baniyas Road, Suite 17-08
contact@pyrohgen.com
www.pyrohgen.com

PART 1: MASS MARKETS AND HEAVY INDUSTRY (LOW-HANGING FRUITS)

Unlike ordinary (flat) graphene, CNO has the shape of a sphere (“nano-ball”).

1. **Does not stick together:** Easily mixed in concrete, oil, and other liquids (unlike regular graphene).
2. **Bearing effect:** The balls roll, dramatically reducing friction.
3. **Cost/Scale:** Production from gas close to the point of use allows it to be added to asphalt and concrete in tons.

SECTION 1: CONSTRUCTION AND INFRASTRUCTURE

Consumption potential: Hundreds of thousands of tons. The market is gigantic, inert, but hungry for raw material savings.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
1	**High-strength concrete**	Additive to the mixture for skyscrapers and bridges	Saving 15-20% of cement or reducing wall thickness with the same strength (more saleable area).	Compacts concrete, acts as a “nano-glue”, increasing compressive strength **up to +146%** .
2	**Road asphalt**	Bitumen modifier for federal highways	The interval between repairs has been doubled. The road doesn't "float" in hot weather (no ruts) and doesn't crack in cold weather.	Graphene makes bitumen refractory in summer and elastic in winter.
3	**Seaports and**	Hydraulic concrete	The piers have stood for 50+ years without repair. Salt water doesn't	CNO reduces the permeability of concrete by **400%** by clogging the

	dams		corrode the reinforcement inside.	pores.
4	**Paving slabs**	Strengthening additive	Reduced breakage during transportation and installation from 5% to 1%. Tiles do not crumble after winter.	Increases flexural strength by **79.5%** .
5	**Insulation (foam/XPS)**	Filler for slabs	A 5 cm thick slab heats as well as an 8 cm thick one. Saving living space and logistics.	Blocks infrared radiation (heat), preventing it from leaving the house.
6	**Mounting foam**	Additive to cylinders	The foam doesn't crumble to dust in the sun after a year. The windows aren't drafty.	Polymer protection from ultraviolet radiation (sun) and strengthening of cells.
7	**Self-leveling floors (Warehouses)**	Antistatic coating	The floor does not accumulate static (there are no sparks in fuel and lubricants/electronics warehouses) and does not generate dust.	Graphene conducts electrical charge into the ground.
8	**Facade plaster**	Reinforcement of the mixture	The facade does not become covered with a network of cracks (“spider web”) when a new house settles.	Works as invisible reinforcement at the micro level.

9	**Concrete pipes**	Sewage collectors	The pipes are not damaged by acids and waste water.	Carbon is chemically inert and protects the concrete matrix.
10	**Sandwich panels**	Filler (mineral wool/foam)	Increased fire resistance rating. Reduced building insurance costs.	When heated, it creates a “crust” (coke), preventing the fire from reaching the filling.
11	**Tile adhesive**	Adhesive (stickiness)	Heavy porcelain tiles don't slide off the walls. Pool tiles don't fall off.	Increases the adhesive strength of the adhesive to the surface.
12	**Roof waterproofing**	Bituminous mastics	The roof doesn't leak. The mastic doesn't melt in the sun or crack in the winter.	Increases the operating temperature range of bitumen.
13	**Railway sleepers**	Composite concrete	The sleepers dampen vibrations from trains better and crack less.	Damping (extinction) of shocks at the nanolevel.
14	**Aerated concrete blocks**	Strengthening partitions	Blocks break less during unloading and laying walls.	Strengthening fragile cell walls of aerated concrete.

SECTION 2: LUBRICANTS AND AUTOMOTIVE CHEMICALS

Potential: Tens of thousands of tons. The fastest results for the client ("fill it in and feel the difference").

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
15	**Motor oils**	Additive for diesel engines	Fuel savings of 3-7 % (millions of dollars for fleets). Less frequent engine overhauls.	Billions of nano-balls act as **bearings** (reducing friction by up to **80%**).
16	**Industrial oils**	Gearboxes in factories	Lower electricity bills (the machine spins more easily). Less frequent oil changes.	Reduction of the friction coefficient and operating temperature of the unit.
17	**Drilling Lubricant**	Drilling mud	The drill drills a hole faster and wears out less (saving on tools).	Lubrication of a drill at a depth of 3 km under extreme pressure.
18	**Plastic lubricants**	Conveyor bearings	Lubricant should be added once a year, not once a month. This reduces line downtime.	Graphene cannot be squeezed out of the node even under pressure.
19	**Coolant (CNC machines)**	Metal cutting fluid	Milling cutters and drills last **40-60%** longer. The resulting part is smoother.	Removes heat from the cutting area better than water and lubricates.
20	**Transmission**	Gearboxes	The transmission doesn't whine, and gears shift smoothly. The gears last	Smoothing out micro-roughness on

	oils	(gearboxes)	longer.	gear teeth.
21	**Chain lubricant**	Motorcycles, saws, bicycles	The chain doesn't stretch. The lubricant doesn't attract dirt (dry effect).	Creates a dry, slippery film that repels dust.
22	**Railway lubricant**	Wheel-Rail Pair	Rails wear down three times slower on turns. Less creaking.	Reduced metal-to-metal wear.
23	**Antifreeze (Tosol)**	Coolant	The engine doesn't boil in traffic jams. The heater heats up faster in winter.	Graphene transfers heat **20-70%** better than the liquid itself.
24	**Formwork lubrication**	Construction	The concrete comes off the form perfectly smooth, and the formwork does not need to be cleaned.	Strong separating properties.
25	**Food grade lubricants**	Bakery conveyors	Safe lubricant for furnaces (carbon is non-toxic, unlike chemicals).	High temperature resistance (>300°C) without harmful fumes.
26	**Lubrication of locks**	Aerosols (WD-40 equivalent)	The locks do not freeze or jam for years.	Moisture displacement and long-lasting lubrication.

27	**Hydraulic oil**	Excavators and presses	Hydraulics operate smoother and pumps last longer.	Protection against scuffing in high pressure pump.

SECTION 3: ENERGY AND BATTERIES *The highest-margin market. CNO makes batteries more powerful and durable.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
28	**Electric car batteries**	Anode (Si@CNO)	The car travels 800 km instead of 400 km.	The CNO shell allows the use of silicon (capacity **several times** higher than graphite) without allowing it to deteriorate.
29	**Charging gadgets**	Conductive additive	The phone charges to 100% in 15 minutes.	Accelerates the movement of ions inside the battery (diffusion x125).
30	**Car batteries (lead)**	Additive to paste	A typical battery lasts 7-8 years. Ideal for start-stop mode (city traffic jams).	Prevents plates from “dying” (sulfating) due to undercharging.
31	**Supercapacitors**	Electrodes	Instant energy storage (braking	The huge surface area of graphene

			recuperation for buses or trams).	absorbs charge like a sponge.
32	**Power cables**	Cable sheath	The cable heats up less and more current can be transmitted over the same cross-section.	Conducts heat from the copper core to the outside.
33	**Solar collectors**	Coolant	The water is heated by the sun faster and reaches boiling point.	The black nano-liquid greedily absorbs sunlight.
34	**Wind turbines (blades)**	Anti-ice coating	The wind turbine does not stop in winter due to icing of the blades.	Ice cannot stick to a slippery and heat-conducting surface.
35	**Thermal paste**	Electronics	Computers and servers do not overheat.	The best heat conductor between the chip and the radiator.

SECTION 4: POLYMERS, PLASTICS AND RUBBER

Replacing heavy metal with lightweight and cheap "super-plastic".

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
36	**Car tires**	Rubber compound	Tires last longer and save gas (roll easier).	The rubber heats up less at speed and wears out more slowly on the asphalt.
37	**Quarry tires**	Tires for dump trucks	Protection against cuts from sharp stones (one tire costs $30-50k).	Extreme tensile strength of rubber.
38	**PET bottles**	Additive for plastic	Beer and soda do not go flat for 6-12 months.	Creates a barrier: gas does not escape, oxygen does not enter.
39	**HDPE pipes (Water/Gas)**	Strengthening the walls	It is possible to make the pipe wall thinner (saving plastic) at the same pressure.	Polymer reinforcement.
40	**Gasoline canisters**	Antistatic	A plastic canister will not produce a spark. Safety.	Removes static charge.
41	**Car bumpers**	Strengthening plastic	The bumper springs back on impact rather than splintering. Cheaper than carbon fiber.	Increases elasticity and impact strength.

42	**Stretch film**	Pallet packing	The film is thinner, but does not tear on the sharp corners of the boxes.	Tensile strengthening.
43	**Conveyor belts**	Mines and quarries	The belt does not break when heavy ore falls. It is non-flammable.	Increasing wear resistance of rubber.
44	**Shoe sole**	Special footwear and sneakers	"Eternal" sole, does not slip and does not wear out.	Improved adhesion and strength.
45	**Plastic heating pipes**	Underfloor heating pipes	The pipe better transfers heat from the water to the floor.	Increasing the thermal conductivity of plastic.
46	**Seals (Rubbers)**	Car windows and doors	They don’t get stiff in winter and don’t crack in summer.	Maintaining rubber elasticity.
47	**3D printing**	Filament (Thread)	The printed part is as strong as a cast one.	The sintering of layers becomes monolithic.
48	**3D printing**	Conductive plastic.	Conductivity or antistatic properties.	Depending on the concentration of graphene in the plastic.

SECTION 5: OIL AND GAS AND ECOLOGY *Million-dollar solutions to global problems.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
49	**Oil recovery (EOR)**	Liquid for injection	Extraction of **+12-17%** oil from old, “empty” wells.	Graphene changes the properties of water, “washing out” oil from the pores of the stone.
50	**Pipelines**	Inner coating	Oil flows faster, pumps use less energy, and the pipe doesn't rust.	Reducing the friction of liquid against the pipe walls.
51	**Sorbent**	Powder for ecologists	1 kg of graphene collects 100 kg of spilled oil from the surface of water.	Absorbs oil like a sponge, repelling water.
52	**Water filters**	Industrial filters	Purification of industrial wastewater from heavy metals and poisons.	Captures atoms of harmful substances better than coal.
53	**Desalination**	Membranes	Obtaining drinking water from sea water is cheaper.	Allows water to pass through, retains salt.

SECTION 6: AGROINDUSTRY (AGRICULTURE) *Innovations for increased yield.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
54	**Watering hoses**	Garden tools	They don't bend, don't burst, and are lightweight.	Reinforcement of walls.
55	**Fertilizers**	Smart capsules	The fertilizer is not washed away by rain, but feeds the plant for months.	Graphene retains useful substances and releases them slowly.
56	**Chemical containers**	Plastic tanks	You can store poisons in cheap plastic without fear of corrosion.	Chemical resistance of the barrier layer.

PART 2: TRANSPORT, ELECTRONICS, CHEMICALS AND TEXTILES

SECTION 7: SHIPBUILDING AND MARINE TECHNOLOGY

Potential: Thousands of tons. The industry's main challenges are salt corrosion and biofouling, which slows down ships.				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
57	**Bottom paint**	Antifouling (against shells)	The vessel is free of fouling while maintaining speed. Fuel savings of up to **20% are achieved** . No toxic biocides are required (eco-standard).	Creates a nano-texture (“lotus effect”), which washes away bacteria and mollusks with the flow of water.
58	**Icebreakers and tankers**	Ice belt coverage	Ice doesn't strip paint down to bare metal. The body lasts 10 years longer.	The super-hard and slippery coating reduces friction between ice and metal.
59	**Ballast tanks**	Anti-corrosion inside	Tanks are not rotting from the inside due to seawater. This reduces the cost of drydock repairs.	Graphene creates an impenetrable barrier (“scale”) for salt and oxygen ions.
60	**Propellers**	Hydrophobic coating	Propellers are not damaged by cavitation (bubbles) or corrosion. Engine efficiency is higher.	Smoothing the micropores of bronze, water glides without turbulence.
61	**Offshore platforms**	Splash Zone	Piles do not rust in the most aggressive zone (where water is	Exceptional chemical resistance of carbon.

			replaced by air).	
62	**Marine bearings**	Deadwood lubrication	Eco-friendly lubricant: no fines for spills at sea (carbon is inert).	Replacing toxic oils with graphene paste-gel.
63	**Desalination plants**	Filter membranes	Compact units provide more fresh water for the crew and technical needs.	High permeability of membranes with CNO.
64	**Anchor chains**	Anti-corrosion treatment	Chains last 2 times longer in salt water.	Metal surface modification.
65	**Life jackets**	Smart fabric	The vest is lighter, does not rot, and can have built-in passive heating.	Sewn-in carbon threads for strength and warmth.

SECTION 8: ELECTRONICS AND INSTRUMENTATION (MASS SECTOR)

Potential: Hundreds of tons (high margin). Replacement of silver and copper with cheap carbon.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
66	**5G/6G shielding**	Spray inside the case	Gadgets do not interfere with each other. Data is protected from	CNO absorbs radio waves, converting them into negligible heat

			interception.	(stealth effect).
67	**RFID tags**	Printed antennas	Marketplace tags cost pennies and are printed on paper.	Replacing expensive silver ink with cheap carbon ink.
68	**Flexible heaters**	Films in the car/home	Warm flooring as thin as a sheet of paper. It's water-resistant and heats evenly.	Current passes through the graphene layer, generating soft IR heat.
69	**Radiators (LED)**	Heat-conducting plastic	The bulbs are lighter and cheaper (the housing is made of plastic instead of aluminum) and do not burn out.	CNO-filled plastic conducts heat like metal.
70	**Conductive adhesive**	Mounting boards	Solderless electronics assembly (lead-free, eco-friendly).	Nano-ball adhesive closes contacts but holds the part in place.
71	**Touch screens**	Flexible displays	The screen can be bent and will not crack (unlike glass with ITO indium).	Transparent and elastic conductive layer.
72	**Gas sensors**	Industrial safety	Instantly detects ammonia or methane leaks at the plant.	The gas settles on the huge surface of the nano-bulbs, changing the resistance.
73	**Antistatic housings**	Household appliances	Dust does not stick to your TV or laptop.	Removing static charge from plastic.
74	**Smart packaging**	Freshness indicators	The label on meat changes color if the product has begun to spoil.	Reaction of a graphene sensor to decay gases.

75	**Speaker membranes**	Headphones/Speakers	The sound is cleaner, the bass is deeper. The diaphragm is lighter and more rigid.	Improving the acoustic rigidity of the material.

SECTION 9: TEXTILE INDUSTRY AND WEARABLES *Potential: Tens of thousands of tons. Clothing with new functions.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
76	**Heated jackets**	Heating element	The jacket is warmed by a Power Bank, is lightweight, and is machine washable.	Graphene ink is printed directly onto the fabric (no wires).
77	**Workwear**	Fire resistance	The fabric does not catch fire from a spark and does not melt to the skin.	The carbon barrier cuts off oxygen when heated.
78	**Sports uniform**	Antibacterial thread	The T-shirt doesn't smell like sweat even after a marathon.	There is no room for bacteria to grow on the surface of CNO.
79	**Smart gloves**	Sensors	Screen control in cold weather. The glove senses movement (VR).	The fabric conducts electricity.
80	**Shoe insoles**	Heating/Drying	Dry and warm feet in winter.	Moisture absorption and IR heating.
81	**Carpet (Office)**	Wear resistance	The pile does not form “paths” and there is no static shock.	Pile reinforcement and conductive backing.

82	**Tents/Awnings**	UV protection and weight	The awning does not fade, weighs 2 times less than tarpaulin, and is cool inside.	Blocking solar heating.
83	**Bulletproof vests**	Composite	The plate is lighter, but holds the bullet just as well.	Ceramics/polyethylene with CNO have better shock wave damping properties.
84	**Electric blankets**	Safe heating	No risk of fire (as with wire), uniform heat.	Distributed heating layer over the entire area.

SECTION 10: CHEMICAL INDUSTRY AND CATALYSIS

Potential: Tonnage supplies for factories. Replacement of platinum and palladium.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
85	**Styrene production**	Dehydrogenation catalyst	A low-cost alternative to the classics. The plant saves millions on metal purchases.	The CNO surface is active in itself, accelerating the reaction.
86	**Hydrogen**	Water electrolysis	Cheap "green" hydrogen. Replacing platinum in electrodes.	Reducing energy costs for splitting water.
87	**Gas cleaning (CHP)**	Afterburning of emissions	The plant does not pay environmental fines.	Catalytic oxidation of SOx and NOx gases.

88	**Polymer synthesis**	Reaction initiator	Plastic is produced faster and cleaner.	Acceleration of chemical processes.
89	**Hydrogen storage**	Sorbent in cylinders	The cylinder holds more gas at lower pressure (safety).	Hydrogen "sticks" to the huge surface of the nanospheres.
90	**Purification of alcohols**	Filtration	Obtaining ultra-pure alcohol for medicine/electronics.	Selective adsorption of impurities.
91	**CO2 utilization**	Catalyst	Conversion of flue gases into fuel or plastic.	Helps bind carbon dioxide.
92	**Paint and varnish materials (PVM)**	Super black pigment	Perfect coverage (1 coat needed instead of 2). Deep black color.	CNO absorbs almost all light.
93	**Industrial adhesives**	Thermally conductive adhesive	Bonding parts that get very hot (engines).	The glue does not dry out due to temperature, dissipating heat.
94	**Wastewater treatment**	Photocatalysis	The sun itself decomposes toxic waste in the settling tanks.	CNO enhances the effects of ultraviolet radiation.

SECTION 11: AVIATION AND SPACE (CIVIL SECTOR)

Potential: High margins, moderate volumes. Safety is a priority.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
95	**Airplane wing**	Anti-icing	Fewer reagents at the airport. Safer takeoff.	Ice doesn't stick to the wing; built-in heating knocks the crust off.
96	**Fuselage (Composite)**	Lightning protection	If lightning strikes an airplane, the composite does not break.	Graphene disperses lightning current throughout the body, like a metal mesh.
97	**Interior of the salon**	Flame retardant plastic	In case of fire, plastic does not emit acrid smoke.	Forms a coke layer that blocks combustion.
98	**Pilot seats**	Vibration dampers	Less vibration means less crew fatigue on long voyages.	The material dampens microvibrations from engines.
99	**UAVs (Drones)**	Stealth coating	Monitoring drones are not visible on radars (protection from interception).	Absorption of radio waves by microspheres.
100	**Chassis lubrication**	Low temperature	The units operate reliably at -50°C at altitude.	The grease does not thicken in extreme cold.
101	**Satellite panels**	Heat sink	The satellite does not overheat on the sunny side.	Heat distribution in vacuum.
102	**Chassis brakes**	Carbon ceramic brake pads	The plane brakes more effectively and the discs last longer.	Increased heat resistance during sudden braking.

103	**Drone blades**	Weight loss	The drone flies 15% longer on a single charge.	The blades are lighter and stiffer.

SECTION 12: PAPER AND PACKAGING INDUSTRY *Potential: Huge volumes of disposable packaging.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
104	**Cardboard boxes**	Strengthening	The box can withstand more weight when stacked in a warehouse.	Reinforcement of cellulose fibers.
105	**Tetra-Pak (Analogues)**	Barrier layer	The juice will keep for a year without refrigeration. A great replacement for expensive aluminum foil.	Gas-impermeable layer on cardboard.
106	**Wallpaper**	Wi-Fi shielding	Protection against radiation from neighbors or data leakage from the office.	Blocking radio signals.
107	**Banknotes**	Protection against counterfeiting	A mark that cannot be forged on a photocopier.	Unique ink conductivity signature.

SECTION 13: SPORTS EQUIPMENT AND HOBBIES *A market with a high premium for "technology".*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
108	**Tennis rackets**	Frame	A lightweight racket with a powerful shot. It absorbs shock and shock to the hand.	Structural rigidity with low weight.
109	**Skis / Snowboards**	Sliding	They go faster and need to be lubricated with paraffin less often.	Reduced friction with snow.
110	**Bicycle frames**	Carbon + CNO	The frame does not crack when hit by a stone (a problem with regular carbon).	Increasing impact toughness.
111	**Fishing rods**	Forms	The spinning rod bends into an arc but doesn't break. Sensitivity is higher.	Flexibility and strength of the composite.
112	**Helmets**	Foam + Body	The helmet is thinner, but the head protection is better.	Dispersion of impact energy.
113	**Golf balls**	Coating	The ball flies further and more accurately.	Aerodynamics and elasticity balance.
114	**Yachts (Racing)**	Epoxy resin	Lightweight and rigid body for records.	Strengthening of the matrix.

115	**Skateboard wheels**	Polyurethane	The wheels do not wear out on the asphalt for years.	Wear resistance of polymers.
116	**Sneakers**	Insoles	The springy effect when running ("energy return").	Elasticity of the material.
117	**PVC boats**	Textile	It's harder to pierce a boat with a snag.	Reinforcement of material.

SECTION 14: TOOLS AND EQUIPMENT

Increasing the resource of consumables.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
118	**Diamond discs**	Bundle	The disc cuts concrete faster and lasts longer.	Diamond retention, heat dissipation.
119	**Drills for metal**	Coating	The drill does not become dull or overheat (“turn blue”).	Reduced friction in the cutting zone.
120	**Grinding wheels**	Abrasive	Less clogged with dust, polish cleaner.	Antistatic and heat dissipation.
121	**Garden hoses**	Rubber	They don't stiffen in the cold and don't burst.	UV resistance and elasticity.

Part 3: Medicine, Defense, Ecology and High Technologies

SECTION 15: BIOMEDICINE AND PHARMACEUTICS *Potential: Low volume, ultra-high price. Market with colossal added value.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
122	**Cancer treatment**	Targeted delivery (Drug Delivery)	Chemotherapy kills only the tumor without poisoning the body (hair does not fall out).	CNO works like a "nano-capsule": it hides the toxic drug inside and releases it only in the cancer cell.
123	**Theranostics**	Photothermal therapy	Laser tumor removal without surgery. Fast recovery.	The nano-bulbs accumulate in the tumor and, when exposed to light, heat up intensely, destroying the diseased tissue.
124	**MRI and CT**	Contrast agent	Clearer images, a safe replacement for toxic gadolinium.	CNO (especially with a metal core) “glows” brightly on images, highlighting metastases.
125	**Bone implants**	Scaffolds (Frames)	Artificial bone is stronger than titanium and heals twice as fast.	The carbon framework stimulates bone cell division.
126	**Alzheimer's Treatment**	Overcoming the BBB	Delivering drugs directly to the brain (where regular pills cannot go).	The nano size allows it to “leak” through the brain’s protective barrier.
127	**Glucometers**	Non-invasive sensors	Measuring sugar without pricking a finger (using sweat or tears).	Graphene's hypersensitivity to glucose molecules.

128	**Dental fillings**	Nano-composite	The filling is “eternal”, does not shrink (no secondary caries) and does not wear out.	Reinforcing a polymer with nanoparticles is like reinforcing concrete with rebar.
129	**Vaccines**	Adjuvant (Carrier)	The vaccine is stable without refrigeration, the immune response is stronger.	CNO protects the active substance of the vaccine and delivers it into the cell.
130	**Nerve regeneration**	Conductor tubes	Restoring sensitivity after nerve ruptures.	Conducting tubes guide the growth of nerve endings.
131	**Faux leather**	Electronic skin	Prostheses that sense touch and heat.	Flexible network of pressure sensors.
132	**Hemodialysis**	Sorbent	The artificial kidney works more efficiently and the filter does not become clogged.	Selective removal of blood toxins through nanopores.
133	**Antibacterial bandages**	Bandages	The wound heals without antibiotics and suppuration.	Bacteria die upon physical contact with the graphene surface.

SECTION 16: DEFENSE TECHNOLOGIES (DUAL-USE)

Potential: Government contracts and strategic security.

No.	Product /	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)

	Object			
134	**Stealth coatings**	Radar Absorption (RAM)	A tank or an aircraft is invisible to radars and thermal imagers.	CNO absorbs radio waves, converting them into heat rather than reflecting them back.
135	**Bulletproof vests**	Ceramic plates	Armor is 20% lighter and can withstand a burst of fire from a machine gun (survivability +30%).	CNO bonds the ceramic, preventing it from shattering into dust on the first impact.
136	**EMP protection**	Bins and electronics	Protection of headquarters from electromagnetic pulse (nuclear explosion/electronic warfare).	Creating a "Faraday cage" in concrete walls or a radio housing.
137	**Night vision devices**	Cooling of matrices	The device sees more clearly, the battery drains more slowly.	Effective heat dissipation from the sensitive sensor.
138	**Explosives**	Stabilizers	The shells are safe to transport (they do not detonate on impact), but are more powerful.	Phlegmatization (decreased sensitivity) of explosives.
139	**Propellant**	Combustion catalyst	The rocket flies further and more stably.	Acceleration and equalization of the combustion rate of solid fuel.
140	**Gas masks**	New generation filters	Protection against combat gases that penetrate ordinary coal.	The ultra-high specific surface area captures even small poison molecules.
141	**Communicatio**	Compact/Flexible	Long-distance communication with	High conductivity allows to reduce

	n antennas		miniature antenna sizes.	the dimensions of the vibrator.

SECTION 17: ECOLOGY AND ENVIRONMENTAL CLEANING *Potential: Global environmental projects and ESG.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
142	**Spill response**	Oil sponges	The sponge can be wrung out and used 100 times. The oil is sent for recycling.	Superhydrophobic: The material absorbs oil but repels water.
143	**Nuclear waste**	Radionuclide sorbent	Water treatment at nuclear power plants. Safe waste storage.	CNO "locks" uranium and thorium ions within its structure.
144	**Desalination (CDI)**	Electrodes	Getting fresh water using electricity (cheaper than reverse osmosis).	Salt ions “stick” to the electrodes under current (capacitive deionization).
145	**Gold mining**	Gold extraction	An environmentally friendly replacement for cyanide and mercury. Increased metal yield.	Efficient sorption of gold ions from lean solutions.
146	**Air purification**	VOC filters	Formaldehyde and odor removal in offices/homes.	The huge surface works like a molecular vacuum cleaner.
147	**Microplastics**	Traps	Purification of drinking water from	Electrostatic particle collection.

			plastic nanoparticles.	
148	**Soil reclamation**	Agro-additive	Returning contaminated fields to cultivation. Pesticide binding.	Immobilization of toxins in the soil to prevent them from reaching plants.
149	**CO2 utilization**	Solid sorbent	Filters on factory pipes for the sale of emission quotas.	High CO2 capacity at high temperatures.
150	**Arsenic removal**	Well filters	Saving regions with poisoned groundwater.	Specific chemical bond with arsenic.
151	**Photocatalysis**	Self-cleaning of facades	Buildings themselves clean the city air from smog.	In the sun, CNO breaks down exhaust gases into harmless substances.

SECTION 18: ADDITIVE TECHNOLOGIES (3D PRINTING)

Potential: Fast-growing market. Transformation of CNO into finished products.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
152	**Printed electronics**	Conductive ink	Printing microchips on a home printer. Inexpensive RFID tags.	CNO ink conducts electricity immediately after drying.
153	**FDM printing**	Filament (PLA/ABS)	The printed part is as strong as cast iron. Gears can be printed.	CNO improves the sintering of plastic layers between themselves.

154	**Metal printing**	Powder metallurgy	Parts without pores or cracks. Light alloys as strong as steel.	CNO improves powder flowability and metal structure during melting.
155	**SLA/DLP printing**	Photopolymers	Printing of super-hard models (jewelry, dentistry).	Strengthening brittle resin with nano-balls.
156	**4D printing**	Smart materials	The part changes shape when heated (self-assembly).	Thermal conductivity of CNO activates the "shape memory" of the polymer.
157	**EM shielding**	Printing of cases	The device body immediately protects against interference (no need for foil).	Plastic becomes a conductor of radio waves.
158	**Aerospace**	PEEK plastic	Printing parts for satellites (lighter than aluminum, can withstand +250°C).	Strengthening of refractory superplastics.
159	**Plastic recycling**	Recycling	Printing from recycled bottles with virgin quality.	CNO restores the strength of old plastic.
160	**Printing magnets**	Composite	Complex magnets for electric motors.	Binding of magnetic powder in polymer.

SECTION 19: SENSORICS AND IoT (INTERNET OF THINGS)

Potential: Billions of cheap devices.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
161	**Smart concrete**	Crack monitoring	The bridge itself “informs” engineers about microcracks and overload.	Change in electrical resistance of concrete during deformation.
162	**Gas sensors**	Methane detectors	An inexpensive detector in every apartment. Save yourself from explosions.	Instantaneous conductivity response to gas molecules.
163	**Load cells**	Scales and cargo control	More accurate and reliable scales (no mechanics).	Piezoresistive effect (compression changes current).
164	**Agro-sensors**	Soil moisture	Precise watering of fields, the sensor does not rot in the ground (printed on plastic).	Reaction to soil moisture and acidity.
165	**Electronic nose**	Product control	Determining the freshness of meat/fish in a warehouse without opening the packaging.	An array of sensors reacts to the smell of decay.
166	**Wearable electronics**	ECG T-shirts	24/7 heart monitoring without wires or Velcro.	Dry textile electrodes.
167	**Sleep monitoring**	Smart mattresses	Sleep analysis without wearing bracelets.	Pressure sensors are integrated into the fabric.
168	**Logistics**	Shock sensors	Recording of impacts during transportation of fragile cargo (glass,	Cheap sensor sticker.

			electronics).	

SECTION 20: DEEP TECH *Potential: Transition to new energy.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
169	**Hydrogen**	Fuel storage	Safe tanks for hydrogen cars. The gas does not escape.	Composite reinforcement and H2 leakage barrier.
170	**Fuel cells**	Catalyst	Replacing expensive platinum with cheap carbon (reducing the price of the car).	Efficient splitting of oxygen to generate current.
171	**Solid-state batteries**	Electrolyte	Batteries that don't burn and charge in 5 minutes.	Increasing the ionic conductivity of a solid electrolyte.
172	**Perovskites**	Solar panels	Inexpensive flexible panels that can be printed in rolls.	Protection of unstable material from moisture.
173	**Lithium-sulfur batteries**	Cathode	The capacity is 3-5 times higher than Li-Ion (drones fly for hours).	CNO retains sulfur, preventing battery degradation.
174	**Micro-superc apacitors**	Power supply for chips	The battery is directly inside the chip (Energy Harvesting).	High energy density in a micro-volume.

175	**Thermoelectrics**	Generation from heat	Charging the watch from the heat of your hand or sensors on heating pipes.	Converting temperature difference into current.
176	**Flow batteries**	Energy storage	Giant storage units for solar power plants.	Acceleration of reactions in liquid electrolyte.
177	**Biofuel cells**	Implants	The pacemaker works forever due to blood sugar.	Enzymatic catalysis on the CNO surface.
178	**Smart windows**	Energy saving	The glass darkens itself in the sun and generates electricity.	Transparent photovoltaic layer.

SECTION 21: MICROELECTRONICS AND OPTICS

Potential: Miniaturization of gadgets.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
179	**Thermal interfaces**	Processor cooling	Computers run faster without overheating (no throttling).	Replacing thermal paste with graphene pads (heat sink x10).
180	**OLED displays**	Protective layer	Phone screens do not fade and last longer.	Protection of organic pixels from moisture and oxygen.

181	**Fiber optic**	Coating	Internet cable is stronger and more flexible, lasting longer in the ground.	Mechanical protection of fragile glass.
182	**Quantum dots**	TV screens (QLED)	Bright and rich colours, cheaper to produce.	Luminescent properties of CNO.
183	**Soldering chips**	Solder	Contacts do not crack from heating/cooling.	Reinforcement of tin solder with nanoparticles.
184	**Photodetectors**	Camera matrices	Shooting in complete darkness (IR) with cheap cameras.	Wide spectrum of light absorption.
185	**Hard drives**	Head lubrication	The recording density is higher (the head flies lower above the disk).	Ultra-thin protective coating (similar to DLC).
186	**Laser protection**	Optics	Protecting camera sensors and pilots' eyes from laser blinding.	Optical limitation (material darkens under bright flash).
187	**Transistors**	Substrates	Dense chip packaging (3D) without overheating.	Heat dissipation from inside the crystal.
188	**MEMS**	Micro-mechanisms	Micro-mirrors in projectors work forever.	Dry lubrication at the nano level (oil does not work there).

SECTION 22: AEROGELS AND INSULATION *The lightest solid materials in the world.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
189	**Soundproofing**	Aviation	The plane is quiet and the insulation weight is minimal.	Sound damping in nanopores.
190	**Spill sorbent**	Reusable	Absorbs 500 times its own weight.	Porous structure (99% air).
191	**Fire protection**	Construction	The material does not burn or melt at 800°C.	The carbon frame is heat-stable.
192	**Catalysts**	Carrier	The reactor is smaller, the product yield is higher.	Huge active area in a small volume.
193	**Desiccants**	Electronics	Protecting devices from condensation is more effective than silica gel.	High hygroscopicity.
194	**Sports shoes**	Dampers	Better cushioning than foam, lighter weight.	Elastic deformation of the frame.

Part 4: Consumer Goods, Mining, Ceramics and Specialty

SECTION 23: HOUSEHOLD CHEMICALS AND CAR CARE

Potential: Retail market. Products with the "Nano" prefix sell for 2-3 times the price.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
195	**Car polish**	Liquid glass	The car shines, dirt does not stick, the body is protected for 12 months.	CNO fills microcracks in the varnish, creating an ultra-hard hydrophobic shield.
196	**Anti-rain**	Glass coating	Windscreen wipers are unnecessary at 60 km/h. The water rolls off in beads.	Superhydrophobic effect (drops cannot stick to the glass).
197	**Tire blackener**	Rubber spray	The tires look new and jet black for months.	Deep black pigment and rubber protection from UV aging.
198	**Shoe polish**	Hydrophobic impregnation	The boots do not get wet in slush, and the reagents do not damage the leather.	Creates a breathable yet waterproof membrane.
199	**Melamine sponges**	Gain	The sponge does not crumble when rubbed and removes difficult stains faster.	Reinforcement of brittle foam with nanoparticles.
200	**Plumbing cleaner**	Enamel coating	The bathtub and toilet stay cleaner longer (limescale does not stick).	Hydrophobic film on ceramics that repels water.

201	**Furniture polish**	Antistatic	Dust does not settle on the cabinets for weeks.	Removing static charge from varnished surfaces.
202	**Plastic restorer**	Car showroom	The faded grey plastic turns black and matte again.	Nutrition of plastic and protection from the sun (UV filter).
203	**Abrasive pastes**	Removing scratches	Polishing headlights and bodywork without the risk of cutting through the varnish.	Soft spherical nano-abrasive works more delicately than sand.
204	**Antifreeze**	Additive	The liquid does not thicken in the nozzles, the brushes glide more smoothly.	Reduction of surface tension and friction.

SECTION 24: COSMETICS AND PERSONAL CARE

Potential: High margin. Carbon safety confirmed (biocompatibility).

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
205	**Mascara**	Pigment	Perfectly black color, volume without lumps.	CNO is a spherical super black pigment that spreads easily.
206	**Sunscreen**	UV filter	The cream is transparent (does not whiten the skin), but blocks the sun more powerfully than zinc oxide.	Absorption of the entire ultraviolet spectrum by carbon.

207	**Nail polish**	Strengthening	The manicure lasts 3-4 weeks without chips or cracks.	Reinforcement of polymer varnish film.
208	**Hair dye**	Color fastness	The color does not wash out, the hair is shiny, antistatic (no frizz).	CNO “seals” the hair scales and removes static.
209	**Scrubs**	Exfoliant	Deep pore cleansing without damaging the skin (the balls are smooth, unlike the seeds).	Spherical particles roll gently over the skin, collecting dirt.
210	**Deodorants**	Adsorbent	There is no smell for 48 hours, clothes do not get dirty.	Absorption of sweat and odor molecules (better than charcoal).
211	**Toothpaste**	Whitening	Removing coffee/tea stains without damaging enamel.	Soft polishing with nanospheres.
212	**Anti-aging creams**	Antioxidant	Slowing down skin aging (protection from the urban environment).	CNO is a powerful free radical scavenger.
213	**Face masks**	Detox	Drawing toxins from the skin (more effective than activated charcoal).	Highest sorption capacity.

SECTION 25: MINING AND METALLURGY

Potential: Tonnage deliveries. Reduced accident rates and heavy equipment costs.

No.	Product /	Specific application	Business benefit (Value	How it works (in simple terms)

	Object		Proposition)	
214	**Drill bits**	Cooling	The penetration rate is higher, the bit does not burn out in hard rock.	Heat dissipation from the diamond cutting edge.
215	**Mine ventilation**	Air ducts	The pipes do not accumulate static (no risk of coal dust/methane explosion).	Conductive plastic conducts the charge to the ground.
216	**Ore flotation**	Reagent	Extracting a higher percentage of gold/copper from waste rock.	CNO changes the wettability of ore particles, helping them float in the foam.
217	**Conveyor rollers**	Bearing lubrication	The rollers do not jam in dust and dirt, the tape does not tear.	Sealed, abrasion resistant grease.
218	**Quarry dump trucks**	Body lining	The body is subject to less wear and tear when dumping tons of rocks.	Impact-resistant composite coating.
219	**Mine cables**	Insulation	The cable does not rub against stones and does not burn.	Increased wear resistance and fire resistance.

220	**Explosives (Industrial)**	Sensitizer	More efficient rock crushing (less oversized material).	Emulsion detonation velocity control.
221	**Casting molds**	Coating	The casting is easy to remove, the metal surface is smooth.	Non-stick properties of carbon.

SECTION 26: CERAMICS, GLASS AND COMPOSITES *Potential: Solution to the main problem of ceramics - fragility.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
222	**Porcelain tiles**	Strengthening	Large format tiles (3 meters) do not crack during cutting and installation.	CNO inhibits crack propagation in ceramics.
223	**Armored ceramics**	Armor plates	The plate is lighter than steel and can withstand a burst of machine gun fire.	Increasing fracture toughness (Crack bridging).
224	**Refractories**	Furnace lining	Bricks in a blast furnace last longer and do not crack due to temperature changes.	Thermal conductivity equalizes the temperature inside the brick.
225	**Double-glazed windows**	Smart glass	The window is darkened by pressing a button (electrochromic).	Transparent conductive layer.

226	**Cutting tool**	Cermets	Cutters for processing hardened steel last longer.	Reduced friction and heating of the tool.
227	**Ceramic knives**	Strength	The knife does not chip if dropped on a tiled floor.	Reinforcement of zirconium dioxide matrix.
228	**Fiberglass**	Lubricant	Composite reinforcement becomes 30% stronger.	Improving the adhesion of fiber to resin.

SECTION 27: FORENSICS AND SECURITY

A niche market with government support.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
229	**Documents**	Security ink	It is impossible to counterfeit a passport or a banknote using a printer.	Unique spectral or electrical response of CNO.
230	**Explosives**	Markers	The ability to trace the origin of explosives after a terrorist attack.	Chemically inert markers that survive explosion.
231	**Breathalyzers**	Sensors	High accuracy, the device does not need to be calibrated every month.	Sensitivity to ethanol vapors.
232	**Drug tests**	Express analysis	Instant identification of substances at customs.	Electrochemical reaction to specific molecules.

233	**Fire alarm**	Smoke detectors	Activates faster, fewer false alarms from dust.	High sensitivity to combustion products.
234	**RFID seals**	Containers	Protection of cargo from tampering (the seal reports a break-in via radio).	Printed electronics.
235	**Special communications**	Encryption	Random number generators based on quantum noise.	Quantum properties of carbon nanostructures.

SECTION 28: SPECIALTY COATINGS AND ADHESIVES

Solutions for complex industrial problems.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
236	**Epoxy glue**	Conductive	Do-it-yourself repair of the car's rear window defroster.	The glue conducts electricity instead of the wire.
237	**Dry lubricant**	Spray	Lubricates locks, guns, and hinges in cold weather. Doesn't collect dust.	Spraying a layer of carbon balls.
238	**Electronics varnish**	Water resistance	The boards operate underwater or in the tropics.	Hydrophobic contact protection (Conformal coating).

239	**Floor markings**	Warehouses	The paint does not wear off due to forklifts for years.	Wear resistance.
240	**Glue for screens**	Smartphones	The glass does not come off when dropped.	Impact strength of adhesive joint.
241	**Sealant**	High temperature	Sealing of furnaces and engines (+350°C).	Thermal stability of the filler.
242	**Anaerobic fixative**	Thread	The bolts do not loosen due to machine vibration.	Increased friction during polymerization.
243	**Primer for metal**	Zinc filled	Double rust protection (zinc + graphene).	Barrier effect.

SECTION 29: ARTS, DESIGN AND MUSIC

Premium segment and restoration.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
244	**Strings (Guitar)**	Coating	The strings sound brightly for months and do not rust from fingers.	The thinnest protective film that does not muffle sound.

245	**Vinyl records**	Mass additive	Less noise and crackling, the record lasts longer.	Antistatic (dust does not stick) and wear-resistant tracks.
246	**Audio cables**	High-end audio	Audiophile cables for big money.	Protection against interference and skin effect.
247	**Mediators**	Material	They do not wear off and produce a specific “attacking” sound.	Rigidity and glide.
248	**3D sculptures**	Material	Printing durable art objects of complex shapes.	Reinforced plastic for FDM printing.

SECTION 30: PET CARE

A growing market with caring owners. Tonnage consumption of sorbents.

No.	Product / Object	Specific application	Business benefit (Value Proposition)	How it works (in simple terms)
249	**Filler (Cats)**	Additive to bentonite	There's been no odor for a week. Bacteria aren't multiplying.	The most powerful odor absorbent (ammonia).
250	**Shampoo for dogs**	Anti-odor	The wool does not smell "doggy" for a long time, and dirt is repelled.	Sorption and hydrophobic effect.

251	**Aquariums**	Filters	Crystal clear water, fish don't get sick.	Better than charcoal for removing nitrites and toxins.
252	**Cages/Carriers**	Plastic	Antibacterial plastic, easy to clean.	Biocidal properties of the surface.
253	**Loungers**	Textile	Does not absorb odors, wool is easily shaken off.	Antistatic and oleophobic treatment.
254	**Animal tags**	RFID	A permanent mark under the skin that is not rejected by the body.	Biocompatible chip coating.

SECTION 31: MISCELLANEOUS *Unobvious but useful little things.*				
No.	**Product / Object**	**Specific application**	**Business benefit (Value Proposition)**	**How it works (in simple terms)**
255	**Lightning (Zippers)**	Lubrication	The zipper on the jacket doesn't stick.	Dry lubrication of links.
256	**Candles**	Wick	The candle burns evenly and does not smoke.	Carbon regulates combustion.
257	**Thermoses**	Flask	Hot tea for 2 days.	Isolation of radiation in vacuum.

This paper demonstrates that onion-shaped graphene (CNO) is not just a scientific curiosity, but **a versatile platform** for enhancing the properties of virtually any physical product.

PYROHGEN

www.pyrohgen.com

UAE

Dubai, Deira, Al Masraf Tower, Baniyas Road, Suite 17-08

Italy

Montecchio Maggiore (VI), Via 2 Giugno 6

USA

Miami, 4521 NE 5th Terrace, Oakland Park, FL, 33334

China

Chengdu, 中科微电子产业技术西南研究院孵化中心

R&D office, Russia

Novosibirsk, AcademPark, Nikolaev street, 11