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NANOMATERIALS

**MODERN RAW MATERIALS
BASED ON ADVANCED
NANOPARTICLES**

**Company is laureate
of ranking:**

Diamenty Miesięcznika

Forbes

2022

A close-up, low-angle shot of a microscope's objective lenses, which are metallic and cylindrical, arranged in a row. The background is dark and out of focus, showing parts of the microscope's body and a slide. In the top-left corner, there is a white hexagonal grid pattern. In the bottom-right corner, there is a blue hexagonal grid pattern. The text is centered in the lower half of the image.

**WE CREATE PRODUCTS
INSPIRED BY NATURE
THANKS TO OUR EXPERIENCE
AND NEWEST TECHNOLOGIES**



WHAT IS NANOTECHNOLOGY?

NANOTECHNOLOGY IS, IN A GREAT BRIEF, A COLLECTION OF KNOWLEDGE AND ADVANCED TECHNIQUES ALLOWING THE PRODUCTION OF SUBSTANCES AND STRUCTURES IN NANO SCALE. IT MEANS THAT EACH PRODUCT HAS AT LEAST ONE DIMENSION (LENGTH, HEIGHT OR WIDTH), NOT EXCEEDING 100 NM (NANOMETERS). IF THE OBTAINED STRUCTURE HAS THREE DIMENSIONS IN THE NANO SCALE, THEN WE HAVE E.G. NANOSPHERE (E.G. FULLEREN). WHEN TWO OF THEM ARE IN NANO SCALE, THE PRODUCT IS A NANOWIRE, A NANOROD, A NANOTUBE OR ANALOGUE PRODUCT (E.G. CARBON NANOTUBE). WHEN ONLY ONE OF THE THREE DIMENSIONS IS ON THE NANO SCALE, THERE IS A NANO LAYER (FOR EXAMPLE, A GRAPHENE FLAKE). IS 100 NM LITTLE? FOR COMPARISON - THE FLU VIRUS HAS A SIZE OF 80 - 120 NM, WHILE THE STAPHYLOCOCCUS AUREUS (BACTERIA) IS UP TO 1000 NM. WHAT DO HUMAN CELLS LOOK LIKE IN THIS COMPARISON? THEIR NUCLEUS ACHIEVE 6000 NM, AND IT IS ONLY A COMPONENT OF A MORE WHOLE.

TERMINOLOGY

NANOPARTICLES ARE CHEMICAL STRUCTURES THAT HAVE ALTHOUGH ONE DIMENSION IN THE NANO SCALE. NANOMETALS ARE NANOMETRIC PARTICLES CONSISTING EXCLUSIVELY OF THE ATOMS OF A PARTICULAR METAL. NANO-COMPOUNDS ARE CHEMICAL COMPOUNDS (COMBINATIONS OF DIFFERENT CHEMICAL ELEMENTS), FRAGMENTED TO NANO-METRIC STRUCTURES. THIS MEANS THAT NANOSILVER OR NANOCOPPER ARE NOT NANO COMPOUNDS, BECAUSE THE SILVER ATOMS OR COPPER DO NOT COMBINE WITH OTHER ELEMENTS (FOR EXAMPLE, OXYGEN OR CARBON), THEREFORE, NANCOPPER OXIDE IS NANOCOMPOUND BECAUSE IT CONSIST COPPER BONDED WITH OXYGEN IN NANO SCALE. OFTEN THERE ARE ALSO USED TERNS LIKE "NANUBE", "NANOSPHERE", "NANOPYRAMID" OR OTHER SIMILAR. THEY DEFINE THE TYPE OF A PARTICULAR SHAPE OF THE PARTICLE.

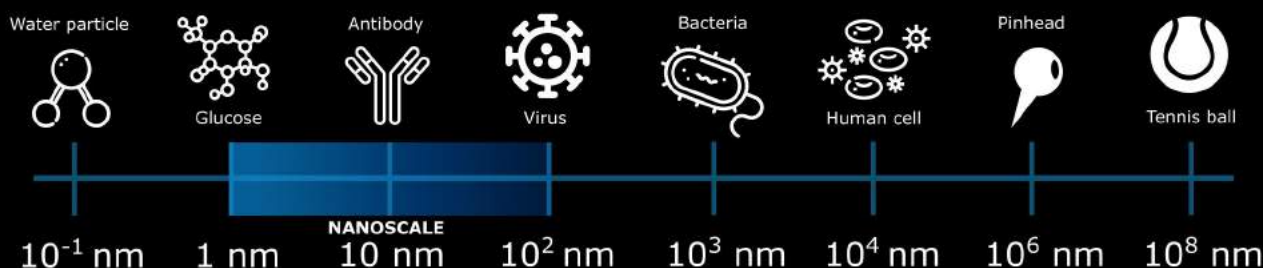
THERE ARE ALSO ADVANCED NANOCOMPOUNDS, OBTAINED IN COMPLICATED CHEMICAL PROCESSES, WHICH CONSISTS OF SEVERAL KINDS OF NANOPARTICLES COMBINED TOGETHER, E.G. SILVER AND COPPER NANOPARTICLES CRYSTALLIZED OVER PHOTOCATALYTIC TITANIUM OXIDE.



SUBSTANCES "REDUCED" TO THE SIZE OF NANOPARTICLES OFTEN HAVE PROPERTIES THAT ARE NOT OBSERVED ON THE "MACRO" SCALE. GOLD, WHICH WE ASSOCIATE WITH YELLOW, CHEMICALLY INACTIVE METAL, IN THE NANO SCALE BECOMES AN EFFICIENT CATALYST WHICH COLORS THE GLASS TO RED. SILVER IN NANO SCALE IS NOT GLOSSY, GRAY METAL, BUT BLACK LIQUID AND ABSORBS UV RADIATION. CARBON NANOTUBES, DEPENDING ON STRUCTURAL DIFFERENCES, MAY FULFILL THE FUNCTION OF INSULATORS OR SEMICONDUCTORS. IN ADDITION, THE KNOWN PHYSICO-CHEMICAL PARAMETERS OF THE SUBSTANCES, SUCH AS THE MELTING TEMPERATURE OR ELECTRICAL CONDUCTIVITY, ARE NOT APPLIED IN NANO SCALE. THESE SOME EXAMPLES SHOW HOW MUCH CAN BE AFFECTED BY THE PROPERTIES OF A SUBSTANCE JUST BY REDUCING THE SIZE OF ITS PARTICLES.



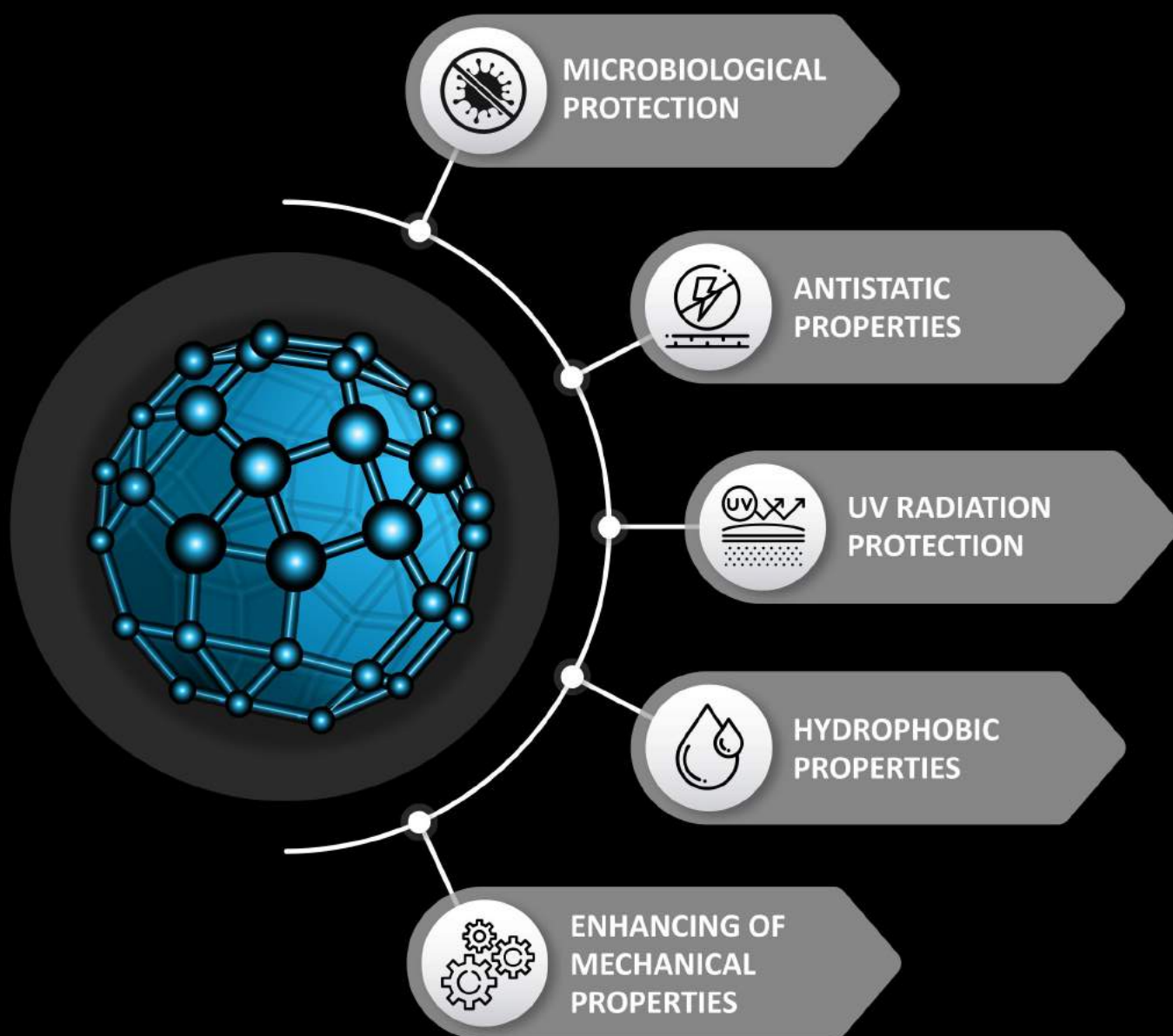
THE UNUSUAL STRUCTURE OF THE "FERN LEAF" MADE FROM METALLIC SILVER CRYSTALS



APPLICATION OF NANOMATERIALS

THANKS TO THEIR PROPERTIES, NANOMATERIALS HAVE BEEN APPLIED IN MANY BRANCHES OF THE INDUSTRY. IN THE MOST OF CASES, THE NEW PERFORMANCE OF THE PRODUCTS GIVEN BY NANOMATERIALS HAVE A PRACTICALLY UNLIMITED DURABILITY. BECAUSE OF DIFFERENT CHEMICAL CHARACTER OF DIFFERENT INDUSTRIAL PRODUCTS, IT IS NECESSARY TO ADAPT THE METHODS OF NANO-MATERIAL SYNTHESIS TO PARTICULAR APPLICATIONS. THEREFORE, OUR COMPANY HAS IN ITS PORTFOLIO APPROX. 30 METHODS OF SYNTHESISING THE NANOS SILVER ITSELF.

IN MANY CASES A SINGLE ADDITIVE MAY HAVE VARIOUS, OFTEN COMPLETELY DIFFERENT PROPERTIES. BEFORE THE INDUSTRIAL APPLICATION OF NANOMATERIALS, IT IS NECESSARY TO CONDUCT A LARGE-SCALE RESEARCH AND DEVELOPMENT WORK. THIS ALLOWS TO ELIMINATE UNWANTED INTERACTIONS BETWEEN MIXTURE COMPONENTS AND POTENTIAL TECHNOLOGICAL PROBLEMS.



SCIENTIFIC COOPERATION

IN ORDER TO ENSURE THE HIGHEST QUALITY OF PRODUCTION AND PROVIDING RELIABLE DATA ON THE EFFECTIVENESS OF THE MANUFACTURED PREPARATIONS, WE COOPERATE WITH NUMEROUS RESEARCH UNITS. THE OBJECTED INFORMATION ALLOW US TO MAXIMIZE THE EFFECTIVENESS OF THE PRODUCTS AND THE CONSTANT DEVELOPMENT OF AVAILABLE TECHNOLOGIES.

THE LONG-TERM ACTIVITY OF OUR COMPANY IN THE AREA OF MANUFACTURING NANOPARTICLES WITH BIOCIDAL PROPERTIES RESULTED IN GRANTING EXTERNAL FINANCING FOR A PROJECT ABOUT FIGHTING THE EFFECTS OF COVID-19 PANDEMY.



**THE ŁUKASIEWICZ RESEARCH NETWORK
INSTITUTE OF MATERIAL ENGINEERING
POLYMERS AND DYES
UL. MARII SKŁODOWSKIEJ-CURIE 55
87-100 TORUŃ**



**THE ŁUKASIEWICZ RESEARCH NETWORK
INSTITUTE OF TECHNOLOGY
AND MEDICAL APPLIANCES
UL. ROOSEVELTA 118
41-800 ZABRZE**



**INSTITUTE OF IMMUNOLOGY AND EXPERIMENTAL
THERAPY POLISH ACADEMY OF SCIENCES
DEPARTMENT OF IMMUNOLOGY OF INFECTIBLE
DISEASES
VIRUSOLOGY LABORATORY
UL. RUDOLFA WEIGLA 12
53-114 WROCŁAW**



**MEDICAL UNIVERSITY IN LUBLIN
DEPARTMENT OF PHARMACEUTICAL MICROBIOLOGY
WITH THE LABORATORY OF MICROBIOLOGICAL
DIAGNOSTICS
UL. DR CHODŹKI 1
20-093 LUBLIN**



**Fundusze
Europejskie
Inteligentny Rozwój**



**MINISTRY OF FUNDS
AND REGIONAL POLICY**

KONKURS 2/2.1/2020 PROGRAM OPERACYJNY INTELIGENTNY ROZWÓJ 2014 - 2020
PRIORYTET 2: WSPARCIE OTOCZENIA I POTENCJAŁU PRZEDSIĘBIORSTW DO
PROWADZENIA DZIAŁALNOŚCI B+R+I DZIAŁANIE 2.1: „WSPARCIE INWESTYCJI W
INFRASTRUKTURĘ B+R PRZEDSIĘBIORSTW” PO IR „DOTACJA NA INFRASTRUKTURĘ DO
ZWALCZANIA COVID-19”

**PROJECT "NANOMATERIALS FOR THE PRODUCTION OF SELF-DISHING
SURFACES, DISINFECTION PREPARATIONS AND SANITARY PRODUCTS"**

NANOSILVER COLLOIDS

NanoAg (PO)

NANOAG (PO) COLOID IS A WATER SUSPENSION OF SILVER NANOPARTICLES STABILIZED WITH THE USE OF HYDROGEN-SOLUBLE POLYMERS AND ORGANIC ACIDS SALTS. THE STABILIZERS USED ARE CHARACTERIZED BY HIGH QUALITY (PHARMACEUTICAL) AND EXCELLENT PROPERTIES AND NO TOXICITY. COLOID WORKS PERFECTLY IN MOST WATER-BASED PRODUCTS - COSMETICS, CLEANERS, PAINTS, COATINGS AND TECHNICAL LIQUIDS.

CONCENTRATION (ppm)	MAX. 8000
SOLVENT	WATER
ZETA POTENTIAL (mV)	< -25
PARTICLES SIZE (nm)	2-10

NanoAg (RES)

NANOAG (RES) COLOID IS A SILVER SUSPENSION IN STYRENE. THE APPLIED SYSTEM OF STABILIZERS IS DISTINGUISHED BY EXCELLENT COMPATIBILITY WITH EPOXY AND POLYESTER RESINS. THE PREPARATION ALLOWS TO OBTAIN ANTIMICROBIAL PROPERTIES IN PRODUCTS MADE OF CASTING RESINS OR GELCOATS.

CONCENTRATION (ppm)	MAX. 16000
SOLVENT	STYRENE
ZETA POTENTIAL (mV)	-
PARTICLES SIZE (nm)	<40



NanoAg (PEG)

NANOAG (PEG) COLOID CONSISTS OF SILVER PARTICLES SUSPENDED IN AN ADVANCED MIXTURE OF FUNCTIONALISED POLYETHERS. THEY ARE AN EXCELLENT STABILIZERS OF THE OBTAINED NANOPARTICLES, AT THE SAME TIME SHOWING COMPATIBILITY WITH POLYURETHANE-BASED COATINGS AND VARNISHES. THE PREPARATION IS ALSO USED IN THE PRODUCTION OF POLYURETHANE FOAM AND RELATED PRODUCTS.

CONCENTRATION (ppm)	MAX. 8000
SOLVENT	POLYETHERS
ZETA POTENTIAL (mV)	-
PARTICLES SIZE (nm)	<25



NanoAg (ORG)

NANOAG (ORG) COLOID IS A SUSPENSION OF SILVER PARTICLES IN AROMATIC SOLVENTS. THE PRODUCT SHOWS PERFECT MIXING PROPERTIES WITH APROTIC MIXTURES, ESPECIALLY WITH PAINTS AND LACQUERS.

CONCENTRATION (ppm)	MAX. 20000
SOLVENT	AROMATIC HC's
ZETA POTENTIAL (mV)	-
PARTICLES SIZE (nm)	<8

NANOSILVER COLLOIDS

NanoAg (SBN)

NANOAG (SBN) COLOID IS A WATER SUSPENSION OF MEDICAL AND PHARMACEUTICAL QUALITY SILVER NANOPARTICLES. THE PRODUCT HAS BEEN TESTED THOROUGHLY FOR ANTIMICROBIAL PROPERTIES. THE TESTS PERFORMED CONFIRM THE STRONG BIOCIDAL PROPERTIES OF THE PREPARATION IN AGAINST BACTERIA, FUNGI AND VIRUSES, INCLUDING BETA-CORONAVIRUSES (WHICH INCLUDE ALSO SARS-CoV-2). THE PRODUCT HAS BEEN APPROVED AS A POTENTIAL PHARMACEUTICAL BY THE VIRUSOLOGY LABORATORY OF THE INSTITUTE OF IMMUNOLOGY AND EXPERIMENTAL THERAPY (HIRSZFELD) IN WROCŁAW.

THE PRODUCT INHIBITS THE CAPACITY OF CORONAVIRUSES TO ENTER THE HOST CELLS BY INTEGRATING WITH PROTEINS ON THE SURFACE OF VIRIONS. THE DESCRIBED MECHANISM OF ACTION OF THE COLLOID ALLOWS ITS USE IN THE FORMULATION OF PHARMACEUTICS, COSMECEUTICS AND COSMETICS, AS WELL AS VETERINATIVE AGENTS. THE USED STABILIZERS ALLOW THE VERSATILE USE OF THIS PRODUCT IN WATER-BASED PREPARATIONS.

CONCENTRATION (ppm)	MAX. 1000
SOLVENT	WATER
ZETA POTENTIAL (mV)	< -30
PARTICLES SIZE (nm)	<5.5



OTHER COLLOIDS

NanoCu

NANOCU COLLOID IS A WATER SUSPENSION OF COPPER PARTICLES, STABILIZED WITH THE USE OF HYDRO-SOLUBLE POLYOLIC POLYMERS AND ORGANIC ACIDS SALTS. THE STABILIZERS USED ARE CHARACTERIZED BY HIGH QUALITY (PHARMACEUTICAL) AND EXCELLENT PROPERTIES. COLOID WORKS PERFECTLY IN MOST WATER-BASED PRODUCTS - COSMETICS, CLEANERS, PAINTS, COATINGS AND TECHNICAL LIQUIDS.

CONCENTRATION (ppm)	MAX. 8000
SOLVENT	WATER
ZETA POTENTIAL (mV)	< -25
PARTICLES SIZE (nm)	2 - 10



NanoFe

NANOFE COLLOID IS A SUSPENSION OF IRON NANOXIDES IN WATER. THE APPLIED SYSTEM OF NATURAL STABILIZERS IS PERFECTLY COMPATIBLE WITH WATER-BASED PREPARATIONS. THE PREPARATION ALLOWS TO OBTAIN ANTIBACTERIAL AND ANTIFUNGAL PROPERTIES, ESPECIALLY IN COMBINATION WITH SILVER AND COPPER NANOPARTICLES.

CONCENTRATION (ppm)	MAX. 20 000
SOLVENT	WATER
ZETA POTENTIAL (mV)	< -20
PARTICLES SIZE (nm)	< 25

NanoAu

NANOAU COLOID CONTAINS GOLD NANOTOPARTICLES DISPERSED IN WATER. THE METAL HAS BEEN STABILIZED WITH COSMETIC QUALITY ORGANIC ACIDS SALTS. THE PRODUCT IS EXCELLET ADDITIVE FOR THE PRODUCTION OF COSMETICS FOR SKIN AND HAIR CARE. IT IS COMPATIBLE WITH COLLOIDAL SILVER AND WITH MOST NATURAL EXTRACTS.

CONCENTRATION (ppm)	MAX. 1000
SOLVENT	WATER
ZETA POTENTIAL (mV)	< -20
PARTICLES SIZE (nm)	< 4



NANO POWDERS

NanoSiO₂

NANOSILICA POWDER IS HYDROPHOBIC (FUNCTIONALISED BY SILANISATION) OR HYDROPHILIC. IT ACT AS AN EFFICIENT CARRIER AND A SUBSTANCE WHICH MODIFYING THE MECHANICAL PROPERTIES OF REFINED PRODUCTS. IMPROVES CONCRETE HYDRATATION, PLANT WATER MANAGEMENT (HYDROPONICS), MODIFIES PLASTIC REOLOGY AND MAY BE AN EFFECTIVE SORBENT.

PARTICLES SHAPE	SPHERICAL
PARTICLES SIZE (nm)	< 10



NSG POWDER

NANOSILVERGUARD POWDER IS AN ADVANCED COMPOSITE CONSISTING OF SILVER NANOPARTICLES CRYSTALLIZED OVER THE SILICA SURFACE. DEPENDING ON THE CHARACTER OF THE CARRIER'S SURFACE, THE POWDER MAY EXHIBIT HYDROPHILIC OR HYDROPHOBIC PROPERTIES. THE PRODUCT ALLOWS TO OBTAIN BIOCIDAL PROPERTIES IN CONSTRUCTION PRODUCTS (PLASTERS, PAINTS) AND IN PLASTICS.

PARTICLES SHAPE	SPHERICAL
PARTICLES SIZE (nm)	< 20



NanoTiO₂

PHOTOCATALYTIC TITANIUM OXIDE IN POWDER FORM. ACTIVE ALOTROPE (ANATASE) CONCENTRATION >99%. THE PRODUCT SHOWS STRONG OXIDATING PROPERTIES UNDER THE UV RADIATION. THIS ALLOWS TO OBTAIN SELF-DISINFECTING SURFACES AND FILTERS FOR REMOVING ORGANIC POLLUTION. THE PRODUCT HAS OUTSTANDING THERMAL RESISTANCE, HOW IT CAN BE USED TO GLAZES AND CERAMICS.

PARTICLES SHAPE	INDEFINITE
PARTICLES SIZE (nm)	< 100

NanoZnO

FLAKE NANOZINC OXIDE. ITS HEXAGONAL, LAMELAR STRUCTURE GUARANTEES EXCELLENT DISPERSIBILITY IN PLASTICS AND MINERAL PRODUCTS. IT EXHIBIT EXCELLENT THERMAL STABILITY AND SHOWS BIOCIDAL PROPERTIES AGAINST OF BACTERIA AND FUNGI.

PARTICLES SHAPE	HEXAGONAL
PARTICLES SIZE (nm)	< 30

PLASTICS FUNCTIONALISATION

THE SMALL SIZE OF NANOTOCOLATES, THEIR HUGE ACTIVITY AND DURABILITY ARE THE PROPERTIES ALLOWING THEIR USE IN PLASTIC PROCESSING. ENRICHING OF PLASTICS WITH NANOMATERIALS (SILVER, COPPER, ZINC OXIDE, TITANIUM OXIDE, IRON OXIDE, GRAPHENE, CARBON NANOTUBES) GUARANTEES MICROBIOLOGICAL PROTECTION AND ANTISTATIC EFFECT DURING UNLIMITED TIME.

THIS IS CARDINALLY IMPORTANT FOR MAINTAINING HIGH STANDARDS OF SANITARY PRODUCTS MADE FROM PLASTICS!

TECHNOLOGY DEVELOPED IN THE ITP-SYSTEM LABORATORY ALLOWS TO OBTAIN HIGH CONCENTRATIONS OF NANOMATERIALS IN THE FUNCTIONALIZED GRANULATES. THANKS TO THIS, THE CONCENTRATION OF THE ADDITIVE IN THE PLASTIC IS RELATIVELY LOW AND THE EFFECTIVENESS - MAXIMAL.

IMPORTANT - ITP-SYSTEM FUNCTIONALISES THE GRANULES SUPPLIED AND USED BY THE MANUFACTURER, SO THERE IS NO NECESSARY TO MODIFY THE PRODUCTION PROCESS IN ANY EXTENT. THE APPLIED NANOMATERIALS ARE CHARACTERIZED BY A SMALL DIAMETER OF PARTICLES, WHICH GUARANTEES EXCELLENT ACTIVITY AT LOW CONCENTRATIONS, AND EASY TO OBTAIN EVEN DISPERSION.

NANOMATERIALS USED FOR THE FUNCTIONALIZATION OF PLASTICS ARE PRODUCED IN POLAND USING THE HIGHEST QUALITY OF RAW MATERIALS. THE PRODUCTION PROCESS DOESN'T POLLUT THE ENVIRONMENT.

THE NANOMATERIALS SHOW TRACE MIGRATION TO THE ENVIRONMENT, WHICH ENSURES THE DURABILITY OF THE PRODUCTS AND THE SAFETY OF APPLICATION IF PRODUCTS ARE IN CONTACT WITH AIR OR WATER.



CARBON NANOMATERIALS

NANOTUBES

THE EXCELLENT MECHANICAL, THERMAL AND ELECTRICAL PROPERTIES OF CARBON NANOTUBES ALLOW THEIR VERSATILE APPLICATION IN THE FUNCTIONALIZATION OF MANY INDUSTRIAL PRODUCTS. WITH EXTRAORDINARY PROPERTIES, THEY ARE EXCELLENT CHEMICALLY STABLE. THANKS TO THIS, IT IS POSSIBLE TO USE THIS RAW MATERIAL IN MANY INDUSTRIAL PRODUCTS.

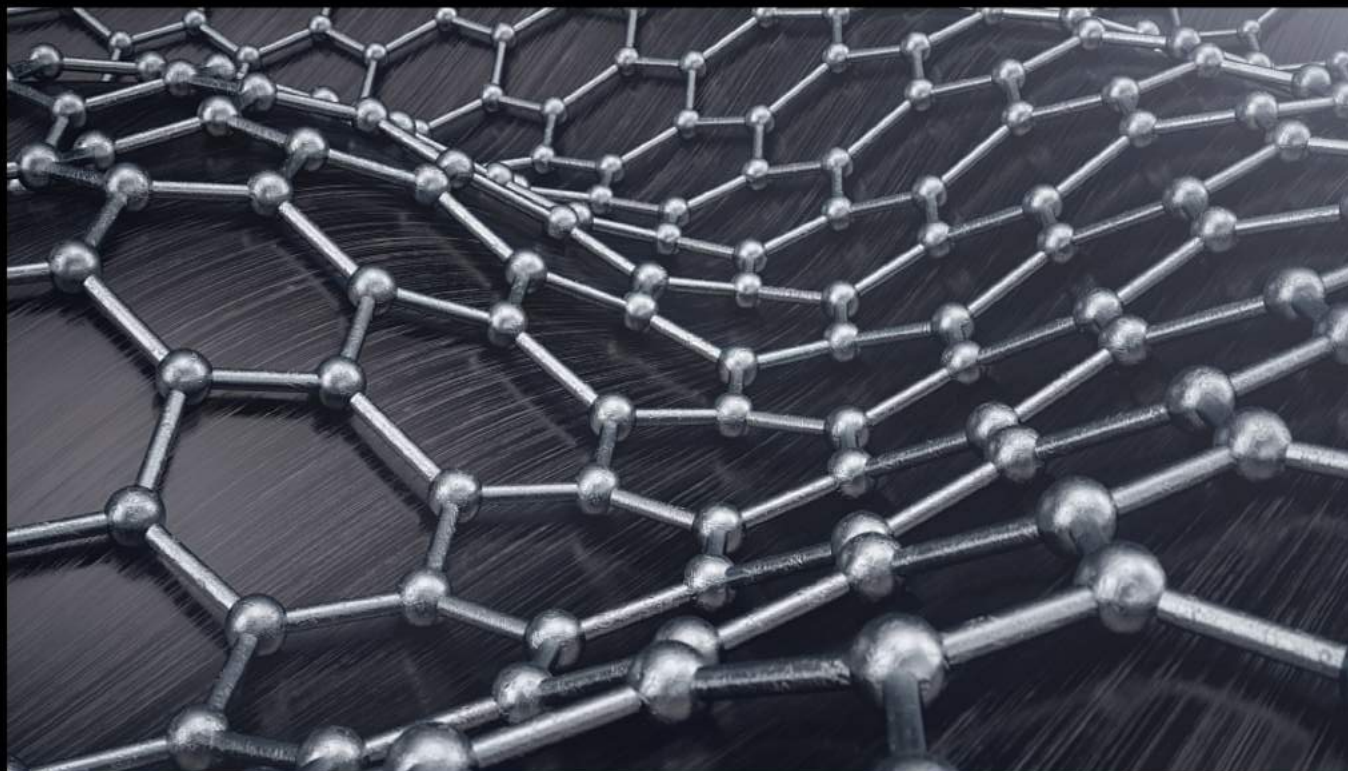
THERE IS THE POSSIBILITY OF DEEP FUNCTIONALIZATION OF CARBON NANOTUBES SO THEREFORE THE IMPLEMENTATION POSSIBILITIES OF THIS RAW MATERIAL ARE PRACTICALLY UNLIMITED.

THE ADDITION OF CARBON NANOTUBES ALLOWS TO INCREASE THE ANTI-ELECTROSTATIC PROPERTIES OF THE SURFACES. USUALLY IT ALSO INCREASES THE MECHANICAL STRENGTH OF THE COMPOSITE, ITS RESISTANCE TO ABRASIVE DAMAGES, TENSILE OR SCRATCHING WHILE REDUCING THE WEIGHT OF THE PRODUCT.

GRAPHENE

ONE OF THE MOST ELECTRIFYING MATERIALS IN RECENT YEARS IS GRAPHENE. THE UNIQUE PROPERTIES OF THIS MATERIAL AND THE SUITABILITY TO DEEP MODIFICATIONS CREATE A WIDE FIELD OF APPLICATION. THE GROWING KNOWLEDGE ABOUT THIS MATERIAL ALLOWS US TO GET CLOSER TO THE NEXT JUMP OF CIVILIZATION. FLEXIBLE SCREENS, SENSORS OR SUPER-FAST BATTERIES ARE FEWER VISIONS, BECOMING A REALITY.

ITP-SYSTEM COMPANY, BEING ONE OF THE MOST ADVANCED NANOTECHNOLOGY COMPANIES IN POLAND, FOCUSED ITS ATTENTION FOR YEARS ON CARBON ALLotropES. IN 2022 WE STARTED THE PRODUCTION OF GRAPHENE IN THE FORM OF GRAPHENE OXIDE (GO) AND REDUCED GRAPHENE OXIDE (RGO) USING OUR OWN TECHNOLOGIES DEVELOPED IN THE ITP-SYSTEM LABORATORY.





ITP-System Sp. z o.o.
Strzemieszycka 8, 42-530
Dąbrowa Górnicza
info@itp-system.pl
www.ITP-SYSTEM.pl