SCIENCE NEWS

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MORE ACCURATE
DIAGNOSIS OF COLORECTAL CANCER

Fluorescent dyes are chemicals used, among others, in medical diagnostics for imaging organs and cells. They can be successfully applied in order to assess the size of a tumor or to determine where it is located. This is particularly important with regard to treatment methods for surgical cancer. Most diagnostic and histopathological methods are based on the use of selective dyes. Due to contact with the human body, dyes used for such purposes should be non-toxic and photostable, which means that their properties must not change under the influence of light radiation. If they are intended for use in an environment with different conditions e.g. with regard to temperature or pH level, they should also be chemically neutral. New styrylquinoline derivatives developed by scientists from the University of Silesia have these properties. Favorable physico-chemical parameters of these compounds will make it possible to use them for imaging biological structures in the diagnosis of cancer, especially colorectal cancer. The solution has been protected by patent. The authors of the new application of para-iminyristrilequinoline derivatives are Assoc. Prof. Anna Mrozek-Wilczkiewicz, Dr. Katarzyna Malarz, Assoc. Prof. Robert Musioł, and Dr. Barbara Czaplińska.

A NEW QUALITY
OF DENTAL IMPLANT COATING

Scientists from the University of Silesia were approached by a manufacturer of dental implants, who asked them to develop special coatings. The aim was to make a new product more resistant to scratches during application. When an implant is screwed in, mechanical damage to its coating often occurs. As a result, up to 10% of the protective layer can be lost, which naturally has an impact on product quality and durability. The newly developed coating, which is produced at room temperature, adheres so strongly to the surface of the implant that it does not need to be additionally sintered at high temperatures, which could contribute to defects. Moreover, amorphous calcium phosphate has excellent tribological properties. In an artificial saliva environment, a lubricant is produced on the surface of the implant, thanks to which the coating is neither rubbed off nor destroyed. Additionally, it supports the regeneration of bone tissue. The coating can be used on two types of materials. The first one are nickel-titanium alloys with shape memory designed for short-term implants, such as implants for surgical correction of skull deformities in children. The second material are titanium alloys designed for long-term use, e.g. dental or spinal implants. The authors of the method for depositing bioactive calcium phosphate coating on the element made of nickel-titanium alloys are MSc Eng. Patrycja Osak, Assoc. Prof. Bożena Łosiewicz, Assoc. Prof. Tomasz Goryczka, MSc Dariusz Gierlotka, Dr. Julian Kubisztal, and Assoc. Prof. Danuta Stróż. The method for depositing bioactive calcium phosphate coating on a titanium element has been developed by Assoc. Prof. Bożena Łosiewicz, MSc Eng. Patrycja Osak, Dr. Grzegorz Dercz, MSc Dariusz Gierlotka, and Dr. Julian Kubisztal.

NEW LAYERS
FOR ELEMENTS MADE OF ALUMINUM AND ITS ALLOYS

Dr. Joanna Korzekwa and Assoc. Prof. Władysław Skoneczny have developed methods to produce composite layers and a double top layer on substrates made of aluminum or its alloys. Both inventions have been patented. Machine, vehicle, or equipment parts made of aluminum or its alloys cannot be used as sliding elements because of too low hardness and susceptibility to adhesive bonding with metals. Therefore, it is necessary to develop layers that will protect the parts designed in this way. Properly composed layers have self-lubricating properties, increase the hardness of aluminum components, and improve their anticorrosive properties and thermal conductivity. Thus modified materials could be successfully used as a structural element in systems with strong friction and wear of parts, such as slide bearings or guides. Researchers from the Faculty of Science and Technology at the University of Silesia have developed two new, relatively simple, and economically efficient methods to obtain materials based on aluminum, characterized primarily by high resistance to abrasive wear.

ESTABLISHMENT OF THE SPIN-LAB
MICROSCOPIC MATTER RESEARCH CENTER

In April 2020, scientists at the University of Silesia started to work on the creation of a Poland-wide unique competence center specializing in the field of microscopic soft matter research. The undertaking is a part of the project "Microscopic Matter Research Center (CMBM SPIN-Lab)," and its implementation allows for advanced scientific research, R&D, and training activities. The project involves the construction of a new facility on the premises of one of the campuses of the University of Silesia which will be equipped by several modern electron microscopes permitting to perform correlation studies of matter, including a cryogenic transmission microscope and scanning microscopes coupled with spectroscopic techniques, as well as confocal and atomic force microscopes. The establishment of the CMBM SPIN-Lab is intended to consolidate and to develop research conducted in the region on, among others, physico-chemical properties of modern materials and nanomaterials used in medicine, pharmacy, aviation, automotive, and many others.

THE T2K EXPERIMENT
IN *NATURE*

The April 2020 issue of the scientific journal Nature featured the publication of research results obtained by an international team of scientists in the Tokai-to-Kamioka neutrino experiment (T2K). This discovery is intended to help to understand, among other things, why there is much more matter than antimatter in the universe and why a difference between the laws of physics governing particles and antiparticles exists. Physicists from the research group of the Institute of Physics at the University of Silesia, headed by Professor Jan Kisiel, also take part in the T2K experiment. The participation of Polish scientific teams in the neutrino experiment, which featuresh a long T2K measurement base in Japan, began in 2006 with the involvement of researchers in building the close ND280 detector in the Japan Proton Accelerator Research Complex (J-PARC) located in Tokai on the Japanese east coast.