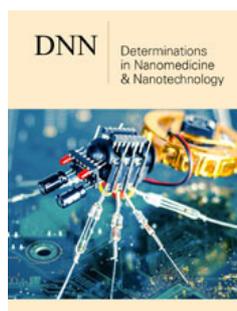


Protection of Medical Instruments from Infection with Protective Nanocoating's

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Opinion

A new method [1] of applying protective coatings and healing nano-bundles of medical instruments is considered, that provides reliable protection of the medical instrument from penetration of pathogenic microbes.

In the literature [2-4] various methods of protection of medical instruments from infection by reducing surface micro-roughness or the creation of protective nanofilms during sterilization or processing of the instrument are considered. However, even prolonged heating and exposure to aggressive agents (such as hydrogen peroxide or synthetic detergents) does not guarantee reliable elimination of pathogenic microbes in the surface micro- and nano-cracks of the instrument. Such defects of the surface layer occur during processing and increase during operation, as well as in the process of multiple sterilization tools. Enough is a reliable method [4] protection tool against contamination and corrosion nonplusing plated metal layer with a thickness of several microns. However, during sterilization, this layer cracks and pathogenic microbes remain in the cracks, the number of which increases with the expansion of cracks. In this case, the protective coating loses continuity.

We went the way of reliable narashivanie of microdefects and surface coating for protective nanofilms, resistant to solutions used in sterilization. For this purpose, a new method [1] of electro erosive coating in a previously unused working environment of liquid nitrogen or other liquid gases that do not have combustibility and have a low cost was used. The contrast effect of the liquid gas temperature and the heat from the discharge on the tool surface causes micro and nano movements of the tool surface layer. Such movements create a pumping effect that ensures filling microcracks by processing products, which after solidification create a monolithic structure, inaccessible to microbes. In the previously known method is sufficient protection from infection, but micro-particles of nitrides or carbides can get on the surface of the tool and through diffusion to create micro factory that violate the continuity of nanofilms. In addition, during operation, such particles can break away from the tool and get into the wound, which is unacceptable. This limitation is eliminated in the method [1], where technically pure titanium and liquid gas supply to the zone are used as an electrode-tool watering treatment until the formation of visible liquid film on the electrodes, then include current pulses and further regulate the preservation of the film by changing the flow rate of liquid gas.

The processes occurring during coating, can be characterized in the following sequence: When the supply of liquid gas to the tool surface, the gas cools the surface, causing a closure of all microcracks, after the current pulse are formed by layers of plasma, which includes elements of nitride (and other gases; carbides of titanium).The pulses can have a duration of several nanoseconds, but this is enough for the microcracks to open and the processing products to penetrate the microcracks. Then, under the influence of gas, the surface is cooled, and the entire surface of the part becomes monolithic, and an oxide-type nanofilm is formed on it. In the proposed method, the Krul particles of nitrides do not have time to form and strengthen on the surface of the tool. To do this, regulate the watering of the gas in such a way that the liquid falls first on the electrode-tool and only then-on the treated surface. The electrode-tool is moved on the treated surface with the help of numerical control units having

self-learning devices. Such units have electro erosive machines of ELFA-731 type, produced in Sofia.

The cutting surgical instrument with the proposed coating was tested. To do this, several instruments were randomly selected from the entire batch and a layer of titanium nitride was applied in a liquid nitrogen medium. The coating time was about 4 minutes, the liquid nitrogen consumption was about 0.2 liters per minute. When testing the cutting tool found that its resistance increased up to 10times. Studies of the cutting edge at a magnification of up to 800times showed that even after repeated sterilization, microcracks and tears of the film are absent..

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