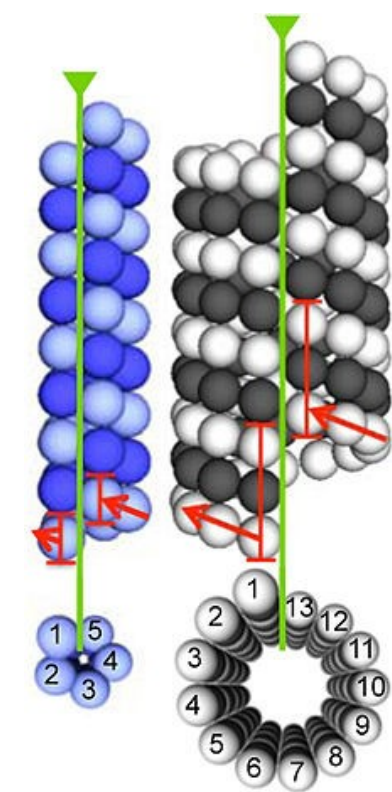
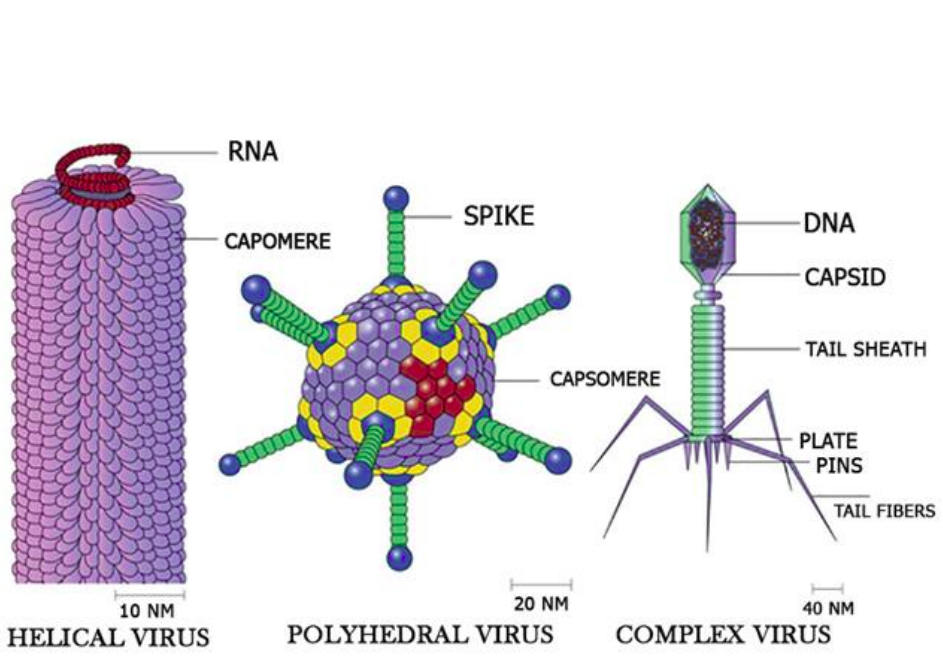


There is renewed interest in the development of new technology agents attributable to the intensified threat of biological weapons use in a terrorist attack. This report put the problem of effective developing of surface contact between contaminated non-transparent liquids (tissue) and UVC radiation (and other type) radiation propagated through porous meta-materials like photon crystals and fiber optics systems. In this aspects the proposed decontamination equipment is based on the two specific effects: near field interaction of UV radiation with viruses and bacterias, and possible tweezer effect of trapping of these microorganism in the decontamination zone.

1. General description of the new method of decontamination

Using meta-materials like optical fibers or periodical photon structures open the new possibilities to manipulate and kill viruses and bacterias in contaminated zones of liquids or organic tissue. The UV action against bacteria and viruses depends on the dimension and volume of the evanescent zone of the photonic periodical guide-wave structures



This technique enables small particles (like viruses and bacterias) to be-picked up and moved at will using a beam of visible light and hence was christened optical tweezers.

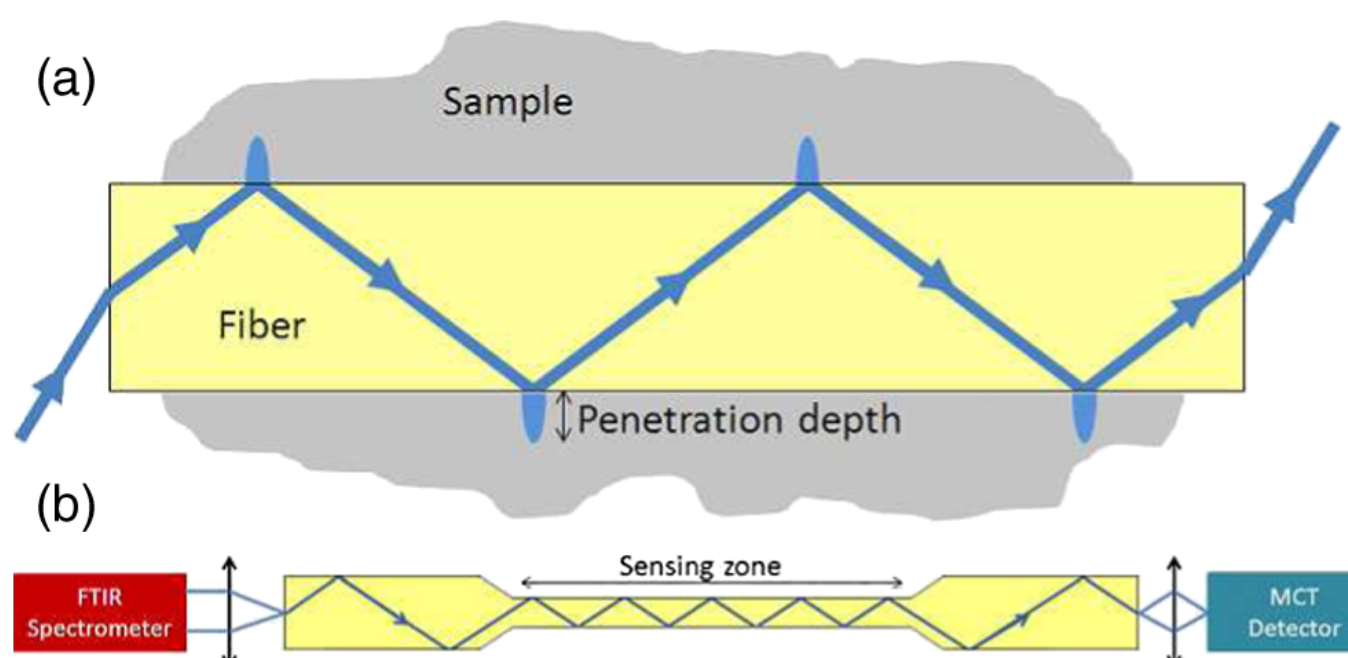
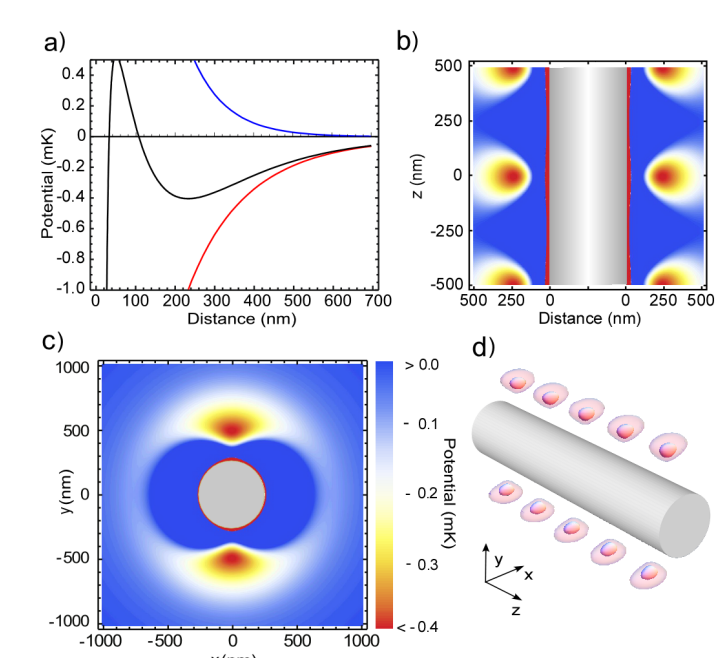


Recent observation of the trapping of dielectric particles along the fibers help us to propose a new perspective on the possibilities to trap the viruses, bacteria and other microorganisms from liquids, in this special zone, where the effective UV decontamination is possible.

III. Construction of Equipment for Effective Decontamination

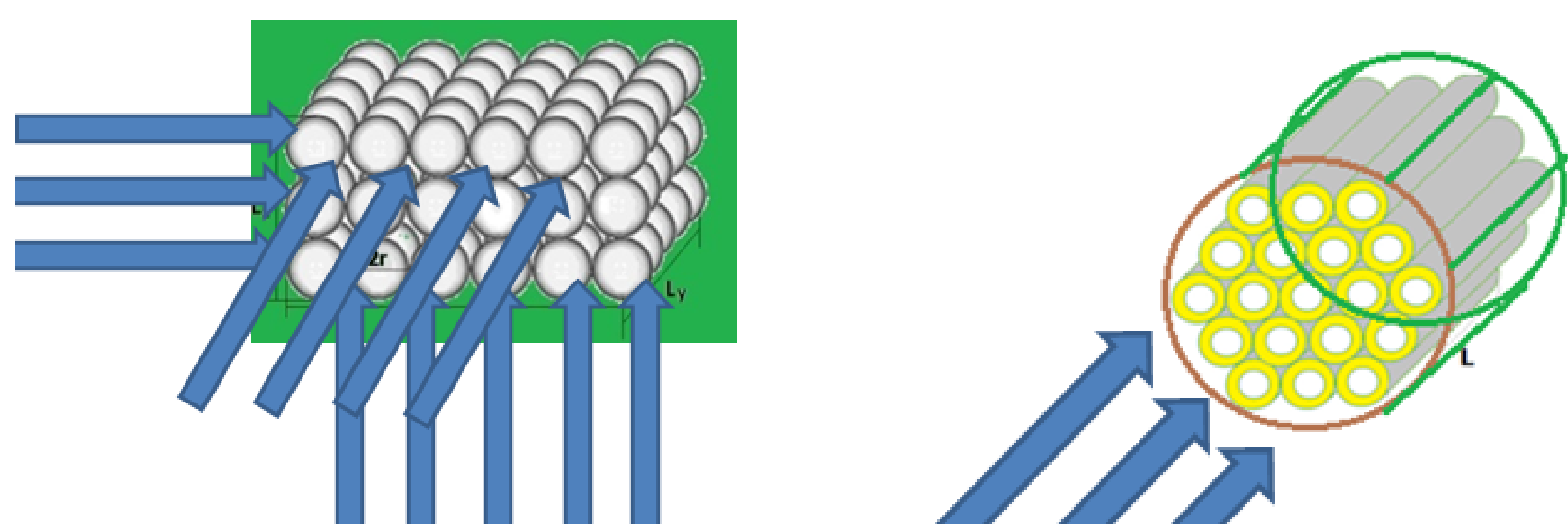
The efficient action of UV pulse on the chemical reactions, which take place in the microorganisms is in the stage of studies. Here we take into consideration the quantified structure of the energy of quasi-particle, transmitted from one DNA segment to another, or in connection of coupled protein micro-tubule. According to our investigations the cooperative effects between the atoms in the process of absorption and emission of photons lies on the photo-transformation process cellular DNA of bacterias. Development of nonlinear models [2] of interaction of UV radiation with microorganisms opens new possibilities decontamination and diagnosis of the new collective processes which take place in viruses, bacterias or other cellular structures under the influence of external UV pulses in the process of its propagation through the multicellular tissue. The possibilities of the selective actions of the UV radiation on the microorganisms with minimal distrusting effects on the human tissue are studied.

The UV action against bacteria and viruses depends on the dimension and volume of the evanescent zone of the photonic periodical guide-wave structures.



II. Meta-materials and their optical proprieties

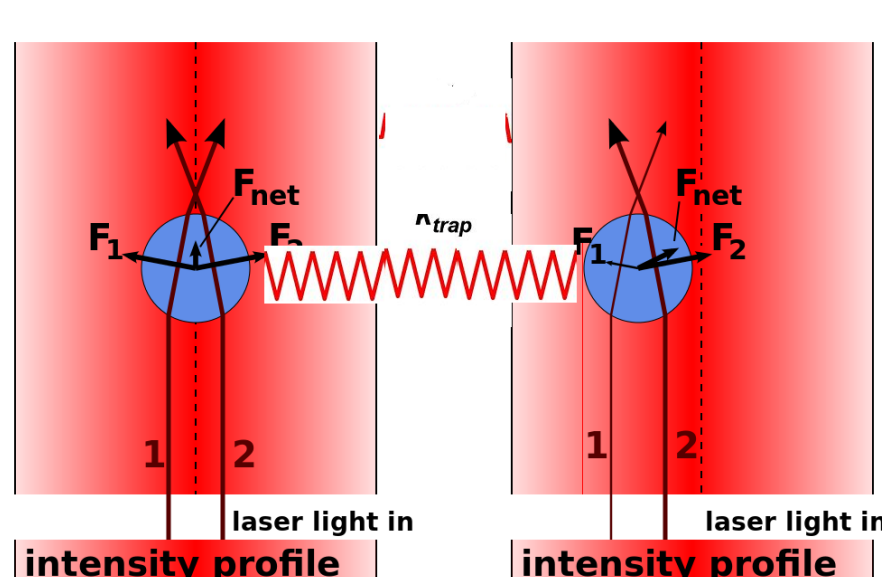
We represented such a periodical structure (fibers and spherical structures) introduced into a funnel through which the contaminated fluid flows. To improve the efficient decontamination of this guide-weave material, it is proposed a simple periodical structure of the set of planar guide-waves, Periodical Fiber structures and periodical spherical materials was proposed for carrying out the required measurements in the decontamination procedures as a function of the intensity and pulse duration of UV pulses,



$$S = \pi L^2 N^{1/3}$$

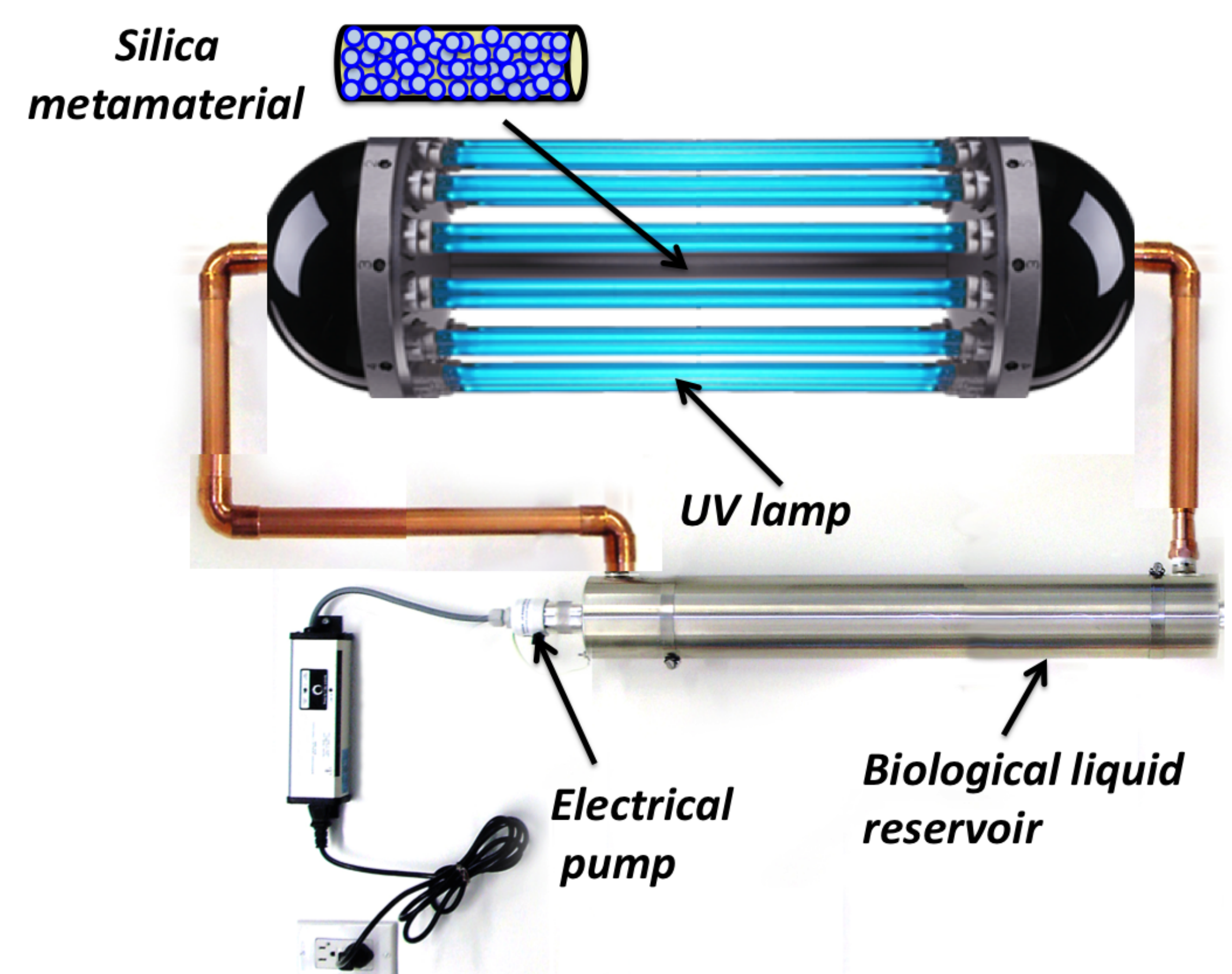
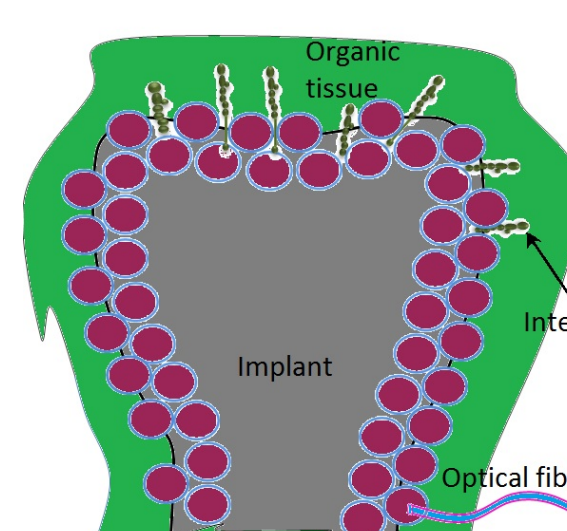
$$S = 2\pi Rh\sqrt{N}$$

Conclusions: We observe that both meta-materials gives a gain in the decontamination surfaces. The he decontamination method described by meta-material like photonic crystal has a priority because it can use the UV sources in three directions! Tweezer effect of Artur Ashkin is possible. The dependence on the number of fibers and number of cavities is so that the decontamination volumes are the following



$$V = \pi L^2 N^{1/3} \lambda / 2$$

$$V = \pi Rh\sqrt{N} \lambda$$



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2. Nicolae Enaki, Sergiu Bazgan, Marina Turcan, Tatiana Paslari, Nellu Ciobanu, Carmen Ristoscu b, Ashok Vaseashta c, Ion Mihailescu "Improvement in Ultraviolet Based Decontamination rate Using Meta-materials, Applied Surface Science, (Accepted)"

III. Photon crystal meta-materials in decontamination of implant surfaces

A good mechanical contacts of implant with organic tissue is possible. To avoid the chirurgical intervention of contaminated surface the UV administration of implant surface are possible.