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# Composite Metamaterials for Biological Decontamination of Fluids

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The dependence of the contact surface of contaminated fluids with metamaterial, formed from various dimension quartz bubbles is proposed. As a simple mathematical model is proposed to packing the space between the relative big spheres with the smaller one with dimensions  $d_1/10$ ,  $d_1/10^2$ , ...,  $d_1/10^n$ . Here  $d_1$  is the diameter of packing the biggest spheres in the system. It is established that this contact surface increase in such metamaterial and becomes proportional to the surface of the smallest spheres proposed in the model. In order to confirm these results experimentally, we propose a series of experiments with yeast fungus dissolved in the water. The systems of metamaterial like fiber optics, a system of quartz bubbles and composite granulated quartz material were proposed in order to demonstrate this effect. The qualitative correspondence between the experimental results and a theoretical model is obtained.