

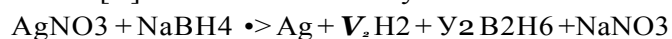
Development of new type of wound dressing based on cryogel matrix with incorporated nanoparticles

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Introduction: A cryogel (polymethyl methacrylate) has been chosen as a basis for new type of wound dressings, where incorporated silver and gold nanoparticles do provide effective antibacterial protection [1]. This function will be enhanced by extracorporeal application of microwave radiation in safe regime.

Materials and methods: Cryogel is a sponge-like, water-based polymer material that is produced by freezing process. During freezing stage of the cryogelation process ice crystals form and then melt at the following defrosting stage. This leads to a loss of ice crystals in the cryogel and creates highly porous structure that is clearly shown on the SEM pictures (Fig.1). Silver nanoparticles have been synthesized using sodium borohydride reduction of silver nitrate [2] method that flows by this reaction:



The synthesis of gold nanoparticles has been conducted through Turkevich method, which is standard procedure for obtaining gold nanoparticles of 10-15 nm diameters [3] (Fig.2).

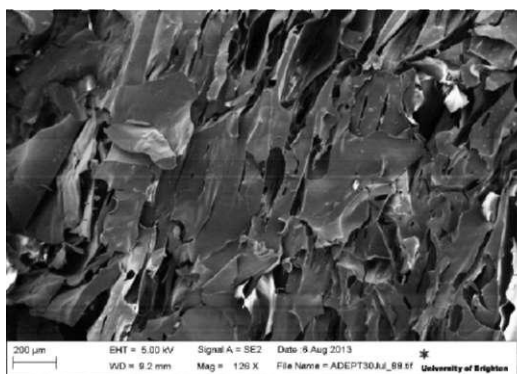


Fig. 1 SEM image: cryogel fabricated at -28C

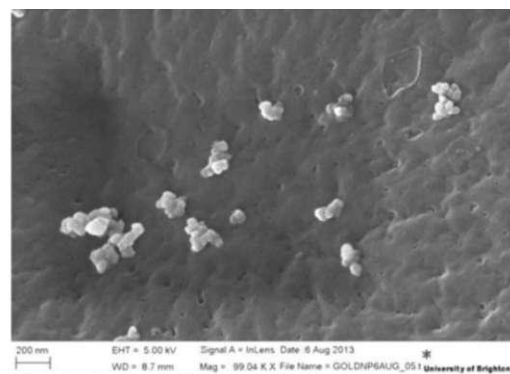


Fig. 2. SEM: Gold nanoparticles on the surface of cryogel

Results and discussion: Production of a variety of cryogels suitable for wound dressings was achieved. Apart from that, several types of metal nanostructures were fabricated, including triangular and circular shapes made of gold and silver. The parameters and properties of nanoparticles / nanostructures have been studied by using tunneling electron microscopy and scanning electron microscopy. The feasibility of conjugation of nanoparticles to the surface of synthetic wound dressings was studied.

References:

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- [3] Shankar S S, Ahmad A, Pasricha R and Sastry M Synthesis of gold nanospheres and nanotriangles by the Turkevich approach, *J. Mat. Chem.* 13 1822 (2003)

Keywords: wound dressing, cryogel, nanoparticles, silver, gold, microwave

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