SYNTHESIS AND DEPOSITION OF AG NANOPARTICLES ONTO POLYPROPTLENE FILM BY ATMOSPHERIC PRESSURE GLOW DISCHARGE TREATMENT

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This report presents a one-step method of silver nanoparticles synthesis and deposition of it onto polypropylene surface by use of an atmospheric pressure glow discharge. Obtained data of UV-vis spectroscopy and Zetasizer indicate that Ag nanoparticles are polydispersed. The polypropylene film surface is modified during gas discharge treatment.

It is known that silver and silver salts have the antibacterial effects. And silver in nanoscale is more attractive due to high surface area and high fraction of surface atoms. At present there are various methods for synthesis of silver nanoparticles (AgNPs) including plasma liquid method. Methods of nanoparticles (NPs) deposition onto different surfaces are main part of the technology development. All methods require more then one step process. It was established that the non-thermal plasmas in liquids are an effective method of polymer surface modification. The silver deposition onto polymer surface would be preventing bacterial attachment. And the DC glow discharge is the most frequently method for synthesis of NPs. The new one-step process method of synthesis of silver nanoparticles and its deposition onto polymer surfaces is described. The silver nitrate was used as sources of NPs and polypropylene films are used as solid templates.

The negative glow discharge is ignited between metallic cathode and liquid anode. The graphite rods (diameter 5 mm) were used as metal electrodes. The discharge current was 5 mA, applied voltage was 1.2 kV, and time of treatment was 4 min.

The boardering peak of surface Plasmon resonance and data of Zetasizer have shown that AgNPs formed in liquid are polydisperse and have an average size of 50-65 nm. Gas discharge treatment leads to appearance of new functional groups onto polymer surface. After treatment in solution with NPs precursor, the surface energy increases due to growth of dispersive component of surface energy. The deposition of AgNPs onto polymer surface has confirmed by SPM analysis (Fig. 1)

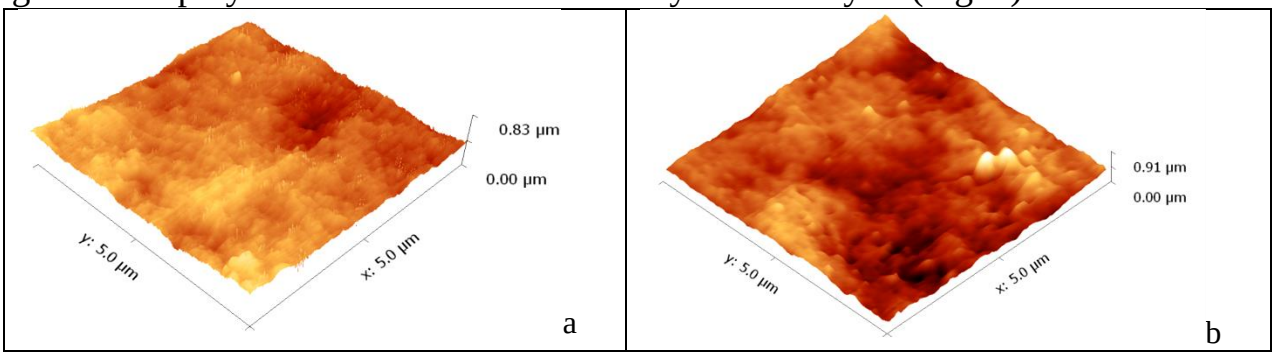

Fig. 1 SPM topographic image of polypropylene films before (a) and after treatment (b)