

# Physico-Chemical Nanomaterials Science

## Structure-properties relationship in polymeric systems based on biuret-functionalized polyurethane with nanosilver

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Development of polymeric functional coating is very popular area of polymer science and technology. Among many types of polyurethanes the biuret-containing polymers (or poly(urethane-biuret), PUB) attract a great attention because of high stability, excellent physical-mechanical and film-forming properties [1], controlled bioactivity [2]. The one of the most known approach to achieve a biological activity of PUB (in oligomeric or high-molecular forms) is partial hydrolysis of PUB into primary amine functionalized products with own effect on living cells or organisms [2]. However, a very prospective and non-destructive method to provide the bioactivity of PUB is an introducing nanodispersed silver into the polymer matrix.

Here we proposed an approach for preparation of nanosilver-containing PUB. An effect of silver nanoparticles (AgNP) on structural organization of cross-linked PUB matrix has been studied. PUB/AgNP nanocomposites were prepared by soaking PUB film in AgNO<sub>3</sub> solution in N,N-dimethylformamide until full saturation reaches followed by thermally initiated reduction of ionic silver into nanoparticulate form. Process of a formation of nanocomposite was controlled by UV-vis spectroscopy. An appearance of multimodal absorption band of plasmonic resonance with maxima at 406 and 443 nm for nanosystem is observed.

Features of nanophase-matrix interaction were identified by FTIR-spectroscopy. Defined changes in spectral parameters of absorption bands of NH and C=O groups of PUB is evidenced of interaction of electron donor functional groups with a surface of AgNP. Note, that more drastical bands evolution was fixed for C=O of biuret fragments of PUB matrix (possibility of FTIR spectroscopy are not allowed to separate NH functions of different structural fragments).

Because of AgNP playing a role of additional cross-linking sites an appropriate effect of inorganic nanophase on lyophilic properties of nanocomposite compared to neat PUB was observed and discussed.

1. Sukhareva L.A., Legonkova O.A., Yakovlev V.S. Polymers for Packaging and Containers in Food Industry. Amsterdam: CRC Press, 2008.
2. Purgett M.D., Deits W., Vogl O. // J. Polym. Sci. Polym. Chem.-1982.-**20**.-P. 2477-2499.