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ABSTRACT:

Antimicrobial Sol-Gel Layers with Nanodiamonds

V. Ruzek¹, P. Louda², S. Mitura², I. Šlamborová¹, P. Exnar¹, A. Karczewska³, D. Witkowski³, K. Buczkowska¹

¹ Technical University of Liberec, Liberec, Studentská 1402/2, Czech republic

² President Stanisław Wojciechowski State University of Applied Sciences in Kalisz, Kalisz, Nowy Świat 4 st., 62-800, Poland

³ Lodz University of Technology, Lodz, 90-5374, Poland

Sol-gel methods are widely used to prepare coatings and thin films, due to their relative technological simplicity, low cost, possibility to easily scale the coating thickness and composition, homogeneity of the coating layer and possibility of coating non-homogeneous surfaces or even complex mechanical parts. These methods also use non-toxic solvents like distilled water or ethanol and may be used to create nanoscale layers and modify coatings with various additives or (nano)particles while using sol-gel methods. Sol-gel coating methods include dip-coating, spin-coating and spray-coating, with the first two being very precise, but with longer application time, and spray-coating being very fast at the cost of the layer being less precise [1]. Sol-gel methods may also be used to prepare antimicrobial coatings for various surfaces, including wood [2], textiles [3], metals [4] and other surfaces. This possibility makes sol-gel coatings a useful technology for protection of public health in hospitals, public transit and other places with higher concentration of people.

This study focuses on preparation and antimicrobial activity testing of sol-gel thin films with detonation nanodiamonds. These nanomaterials are chemically inert, optically transparent, biocompatible, cheap and easy to both manufacture and functionalize, making them a promising and environmentally friendly material for various applications [5]. They also exhibit both antimicrobial and anti-biofilm properties, as they prevent adhesion of microorganisms on the surface. These thin films are deposited on glass samples and tested for changes in antimicrobial and cytotoxic activity, wettability, tribological properties, surface roughness and biocompatibility.

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