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Novel photoactive antibacterial polymer coatings

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Biofilm adhesion on various surfaces is one of the main causes of bacterial infections today. To reduce the frequency and intensity of surface contamination, a number of research groups have been directing their investigations to find alternative and more effective products that have "persistent" antibacterial activity without of risk to generate resistance to them. Among them, an increasing interest attract so-called "self-disinfecting" surfaces. To this group belongs the light activated coatings, which contain photosensitizers, which, when exposed to visible light, produce cytotoxic substances like singlet oxygen and/or free radicals.

In this work, we report on the preparation of novel photoactive antibacterial polymer coatings deposited on stainless steel (SS) substrate. The photoactive antibacterial polymer coatings were prepared by the sequential deposition of three layers. The first layer consists of a catechol-based cationic P(mDOPA)-co-P(DMAEMA+) copolymer, which ensures the strong anchoring to the substrate of SS. The second layer consists of an orthoquinone functionalized nanogel based on Pox(mDOPA)/PAH, which ensures the covalent grafting of the amino modified photosensitizer. The last layer consists of the deposition of an ethylene diamine derivative of protoporphyrin IX (PPIX-ED). Among the photosensitizers, PPIX attracts special attention, since they are widely recognized for their antibacterial activity by producing reactive oxygen species when exposed to visible light. The surface and mechanical properties of thus obtained photoactive coatings were estimated by various techniques as EDX-SEM, scratch test and nanoindentation and their antibacterial photoactivity against Gram-negative E. coli and B. subtilis was demonstrated.

Biography

Nikoleta Filipova is a PhD student in the Department of Polymer Engineering at University of Chemical Technology and Metallurgy in Sofia. She obtained her master's degree in Polymer Engineering from the same university. Her research focuses on polymer coatings with antibacterial activity.

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