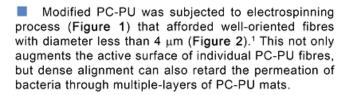


Smart polyurethane nanofibres

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- The global polyurethane (PU) market size was \$ 60.5 billion in 2017 and is projected to grow at \$ 79.2 billion to 2021. High demand for lightweight, durable and cheap materials saving the economic costs has driven the growth in recent years. Therefore, we had selected PU polymer due to its adaptability for various end-use industries such as furniture, automotive, construction, clothing and packaging. We had utilized reactive phthalocyanine (PC) dye to confer additive antimicrobial function to PU matrix. PC-diol is covalently attached to PU polymer (PC-PU), which avoids leakage of PC to the environment and dissipation of PC-PU antimicrobial function (Scheme 1).

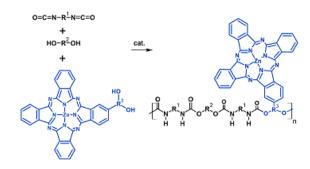


- Photosensing of PC-PU is a promising alternative method that ensures killing of pathogenic microorganisms, which does not induce the development of multiresistant strains.2 Portion of visible light absorbed by PC results in generation of reactive oxygen species (ROS), including singlet oxygen (102), free radicals, hydroxyl radical (HO-) and superoxide anion (O2-) that cause irreversible cell death (Figure 3).3
- Gram-positive, gram-negative bacterial strains and fungi were used to test the antimicrobial influence4 of PC-PU nanofiber mats. Subsequently, obtained results (Table 1) indicated that the prepared nanofibres have good bacteriostatic effect, particularly on gram-positive bacteria and fungi.
- In conclusion, the potential use of PC-PU nanofiber mats as antimicrobial agens has been highlighted.

	Content	darkness (FACS)	
G* bacteria	G*	1.18	
	G+ + PU-PC	0.36	
G ⁻ bacteria	G [.]	0.09	
	G' + PU- PC	0.03	
fungi	fungi	2.09	
	fungi + PU-PC	0.62	

Daylight/

Table 1. Evaluation of bacterial and fungi population (measured by FACS method as the ratio between daylight and darkness counts) without/with PU-PC mats.



Scheme 1. Preparation of polyurethane functionalized by reactive phthalocvanine dve.



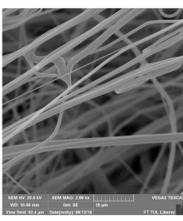


Figure 2. SEM image of PC-PU fibres produced by electrospinning.

Figure 1. Scheme of electrospinning process. Solution of PC-PU is injected into the high-voltage current that is able to electrospin fibres, which are collected on solid support.



Figure 3. Scheme of ROS production by photosensing of PC-PU.



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