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Surface Modification of Silicone with Colloidal Polysaccharides Formulations for the Development of Antimicrobial Urethral Catheters

Matej Bračič^{a*}, Olivera Šauperl^a, Simona Strnad^a, Ivan Kosalec^b, Olivija Plohl^a, Lidija Fras
Zemljič^a

^a Laboratory for Characterization and Processing of Polymers (LCPP), Faculty of Mechanical Engineering, University of Maribor, Maribor, Slovenia.

^a Faculty of Pharmacy and Biochemistry, University of Zagreb, Croatia

Corresponding author:

Matej Bračič

Laboratory for Characterization and Processing of Polymers (LCPP), Faculty of Mechanical Engineering, University of Maribor, Smetanova ulica 17, 2000 Maribor, Slovenia.

T: +386 2 220 7929

E: matej.bracic@um.si

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Abstract

In this work, surfaces of casted silicone sheets and silicone tubes were functionalized with colloidal polysaccharide complexes (chitosan, carboxymethyl chitosan, and hyaluronic acid in combination with a lysine-based surfactant) in order to introduce antimicrobial and antifouling surface properties. The surface chemistry and morphology, as well as the chemical and mechanical stability of the coatings were characterized. For this purpose, different microscopic and spectroscopic methods, pH-potentiometric titrations and standard methods for evaluation of mechanical properties were used. Finally, the antimicrobial and antifouling properties of functionalized silicone materials were evaluated *in vitro*. The findings of the physicochemical characterization showed that a discontinuous 3-step dip-coating process can be successfully implemented to coat casted polydimethylsiloxane sheets and tubes with colloidal polysaccharide complexes. These coatings exhibit slow-release leaching in aqueous environment at pH 4.5, 7, and 8 and show very good stability against mechanical abrasion, thus displaying high stability potential during catheter insertion. The antimicrobial properties against gram-positive bacteria, gram-

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