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Poster

SURFACE-ATRP OF PEGMA ONTO POLYDIMETHYL SILOXANE FOR BIOMEDICAL APPLICATIONS

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Abstract: Silicone rubber (poly(dimethyl siloxane; PDMS)), is extensively used for biomedical implants due to its low toxicity, flexible processing techniques, long-term endurance and good blood compatibility. However, the presence of low molecular weight organic molecules and catalyst residues that cause host systemic inflammatory reactions. The hydrophobic nature of PDMS also allows microbial adhesion followed by infection. Hydrophilic PDMS surfaces would be of great value in inhibiting biofilm formation thus prolonging the lifetime of the implants. This could be obtained by surface-initiated atom transfer radical polymerization (ATRP). The robustness and versatility of ATRP allow the preparation of functional bioactive surfaces, including antifouling, antibacterial, stimuli-responsive, biomolecule-coupled and micropatterned surfaces.[1-3]
We aim at establishing the experimental conditions allowing the surface-grafting of polyethylene glycol methacrylate (PEGMA) by surface attaching an initiator (1-trichlorosilyl-2-(chloromethylphenyl)ethane) onto PDMS (Sylgard ® 184). Here, cooper is being used as a metal catalyst and 2,2'-Bipyridine as a ligant. Polymerizations are being assayed in aqueous media.
The native smooth and transparent surface of the PDMS could be preserved following polymerization (as confirmed by SEM). FTIR-ATR also showed the presence of PEGMA polymer chains. By contact angle measurement, a change in the surface hydrophobicity was observed, the values changing from 114º to 60º, following 30h polymerization.
Work is in progress to optimize the modification of PDMS by PEGMA surface-ATRP. This implies following up the polymer chain growth kinetics, surface characterization by XPS, FTIR-ATR, SEM and contact angle measurements. Static and dynamic microbial adhesion, as well as biocompatibility studies are also envisaged.

[1] I. Fundeanu et al. Colloids and Surfaces B 64 (2008) 297-301.; [2] L. R. Rodrigues et al. J Biomed Mat Res B. 81(2007): 358-370; [3] A. Oláah et al. Applied Surface Science 239 (2005): 410-423.

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