DEVELOPMENT OF DURABLE PHOTOGRAFTED ZWITTERIONIC HYDROGEL COATINGS FOR ANTIFOULING OF BIOMATERIALS

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Biofouling causes loss of function and leads to infection for many biomedical devices. In recent years, zwitterionic hydrogel coatings have shown promise in prevention of biofouling to render biomaterials functional for longer. We have developed a new method to create zwitterionic hydrogel coatings by simultaneously photopolymerizing the bulk hydrogel film and photografting to the biomaterial surface (see Figure 1). Thin films, using either sulfobetaine methacrylate (SBMA) or carboxybetaine methacrylate (CBMA) as zwitterion, have been generated using this new method which do prevent fibroblast and protein adhesion. To successfully use zwitterionic hydrogel coatings on implanted biomaterials, a balance must be achieved between antifouling and mechanical durability to ensure that the coating remains attached and viable for the life of the implant. By varying crosslink percent, films with different desirable properties can be created. Higher crosslinked networks lead to decreased swelling (up to 67% for SBMA and 75% for CBMA) and up to 20x increase in compressive moduli. Less swelling and a higher modulus are indicative of stable and durable films. However, the greater amount of crosslinker also decreased the degree of desired antifouling and increased the coefficient of friction (up to 3x increase in relative friction over the tested range, see Figure 1). As the targeted property, films with high antifouling are desirable, and low coefficient of friction will lead to more favorable insertion and interactions with the body. Between five and thirty percent crosslinker provides good compromise between mechanical and antifouling properties.

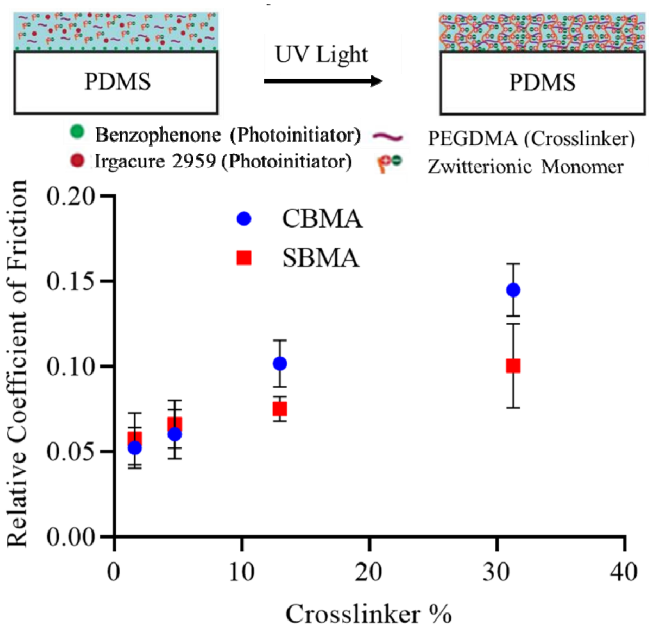

Figure 1. A schematic of the new method for hydrogel formation. Data for the coefficient of friction relative to uncoated biomaterial for different crosslink densities.