

ABSTRACT

The main aim of this work is to synthesize and characterize non-thrombogenic silk fibroin / N, N' methylene diacrylamide biofilms for biomedical applications. Biofilms were prepared via UV-irradiation in the absence of photoinitiator under heterogenous conditions. Swelling and biodegradation tests, SEM, XRD analyses, in-vitro coagulation time test, *in-vitro* platelet adhesion studies were applied to characterize the SF / N,N'-methylene diacrylamide biofilms.

The transparent biofilms have been observed to exhibit as much as 258.4 % swelling in acidic buffer solution (pH = 1.2), 440.16 % swelling in phosphate buffer saline solution (pH=7.4), respectively. The SF / N,N'-methylene diacrylamide biofilms completely biodegraded by protease enzyme. SEM analysis indicated that as the amount of N,N'-methylene diacrylamide increases, the surface smoothness of the biofilms is also increases. XRD analysis showed that the degree of crystallinity of the crosslinked biofilms is higher than that of the pure silk fibroin biofilms.

In-vitro coagulation test and platelet adhesion test analyses indicated that the modified biofilms are more blood compatible than the silk fibroin biofilms.

These results demonstrated that the silk fibroin / N, N' methylene diacrylamide biofilms has potential applications in biomedical sciences.

Keywords: Silk Fibroin, Biofilms, UV-irradiation, Platelet Adhesion, Blood Compatibility, Crosslinking.

ÖZET

Bu çalışmanın amacı, biyomedikal uygulamalarda kullanılmak üzere kan uyumluluğu yüksek ipek-fibroin / N, N'metilen diakrilamide biyofilmleri sentez ve karakterizasyonunu yapmaktır. UV-fotopolimerizasyon tekniği ile heterojen koşullarda oluşturulan biyofilimler Taramalı Elektron Mikroskopu (TEM), X-ışını difraksiyonu, şişme, biyodegradasyon, *in-vitro* pıhtılaşma zamanı ve *in-vitro* platelet adhezyon testleri ile karakterize edilmişlerdir. Asit tampon çözelti (pH = 1.2) içerisinde şişme oranı % 258.4, fosfat tampon çözelti (pH = 7.4) içerisinde şişme oranları % 440.16 olarak tespit edilen transparan biyofilmler, farklı sıcaklık, süre, pH, ipek fibroin / N, N'metilendiakrilamide ağırlık oranları ve farklı dalga boylarında optimum değerleri tespit edilerek incelenmişlerdir. Proteaz enzimi ile yapılan biyodegradasyon çalışmalarında tamamen biyodegrade oldukları gözlemlenmiştir. TEM analizler sonucunda N, N'metilendiakrilamid ile modifiye olmuş film yüzeylerinin daha pürüzsüz ve X ışın difraksiyonu analizlerinde ise kristal yapının oranının, ipek fibroin ile oluşturulan biyofilmden daha fazla olduğu tespit edilmiştir.

In-vitro pıhtılaşma testi ve *in-vitro* platelet adhezyon test sonuçları modifiye olmuş filimlerin trombojenik özelliklerinin saf silk fibroin ile oluşturulan biyofilmlerden daha yüksek olduğu son ucuna ulaşılmıştır.

Bu sonuçlar, kan uyumluluğu yüksek ipek fibrin /N, N'metilendiakrilamid biyofilmlerinin biyomedikal biliminde kullanma alanlarının çok fazla olduğunu göstermektedir.

Anahtar Kelimeler: İpek fibroin, Biyofilimler, UV-irradiasyon, Platelet Adhezyon, Kan Uyumluluğu Çaprazbağ.

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DEDICATION

My parents: Thank you for your unconditional support with my studies I am honored to have you as my parents. Thank you for given me a chance to prove and improve myself through all my walks of life. Please do not ever change. I love you

My family: thank you for believing in me: for allowing me to further my studies. Please do not ever doubt my dedication and love for you

My brothers and sisters: hoping that with this research I have proven to you that these is no mountain higher as long as God is on our side. Hoping that you will walk again and be able to fulfill your dreams.

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LIST OF ABBREVIATIONS

| | |
|-----|---|
| SF | Silk Fibroin |
| ABS | Acetic Buffer Solution |
| PBS | Phosphate Buffer Solution |
| UV | Ultra Violet |
| SS1 | SF biofilm sample prepared by UV-Short wave at 254nm without crosslinker |
| SS2 | SF biofilm sample prepared by UV-Short wave at 254nm with 25 μ l of crosslinker |
| SS3 | SF biofilm sample prepared by UV-Short wave at 254nm with 50 μ l crosslinker |
| SS4 | SF biofilm sample prepared by UV-Short wave at 254nm with125 μ l of crosslinker |
| SS5 | SF biofilm sample prepared by UV-Short wave at 254nm with150 μ l of crosslinker |
| SL1 | SF biofilm sample prepared by UV-Long wave at 365nm without crosslinker |
| SL2 | SF biofilm sample prepared by UV-Long wave at 365nm with25 μ l of crosslinker |
| SL3 | SF biofilm sample prepared by UV-Long wave at 365nm with50 μ l of crosslinker |
| SL4 | SF biofilm sample prepared by UV-Long wave at 365nm with125 μ l of crosslinker |
| SL5 | SF biofilm sample prepared by UV-Long wave at 365nm with150 μ l of crosslinker |
| INR | International Normal Ratio |
| SEM | Scanning Electron Microscopy |
| XRD | X-Ray Diffraction |

