Optimization of Mechanical Properties of Silver Nanoparticles (AgNPS)-Loaded Chitosan/Polylactic Acid (PLA) Biofilms by Using Response Surface Methodology (RSM)

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Abstract. Fabrication of silver nanoparticles-loaded chitosan-polylactic acid based biofilms was successfully employed for investigating the optimal of mechanical properties (i.e. tensile strength and elongation at break) of biofilms using central composite design (CCD), response surface methodology (RSM). In this study, only two factors that influences the biofilm mechanical properties were selected namely concentration of polyethelene glycol 400 (PEG) and percentage volume of polylactic acid (PLA)/chitosan. Analysis of results was performed by using response surface methodology (RSM) to avoid the traditional one-factor-at-a-time experiments. Common statistical tools such as analysis of variance (ANOVA) and response surface plot were used to determine the optimal tensile strength and elongation at break responses. Central composite design (CCD) builds a response surface for mechanical properties of biofilms optimization. From the results of statistical analysis, it could be concluded that the optimal conditions for mechanical properties of biofilms were 7.93% w/w concentration of polyethylene glycol (PEG) and 28.79%/71.21% percentage volume of polylactic acid (PLA)/chitosan. At this optimum stage, 7.99 MPa of tensile strength and 32.6 % elongation at break were obtained. Then, results of verification process have shown that the percentage errors are 2.08% for tensile strength and 3.89% elongation at break, respectively.

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