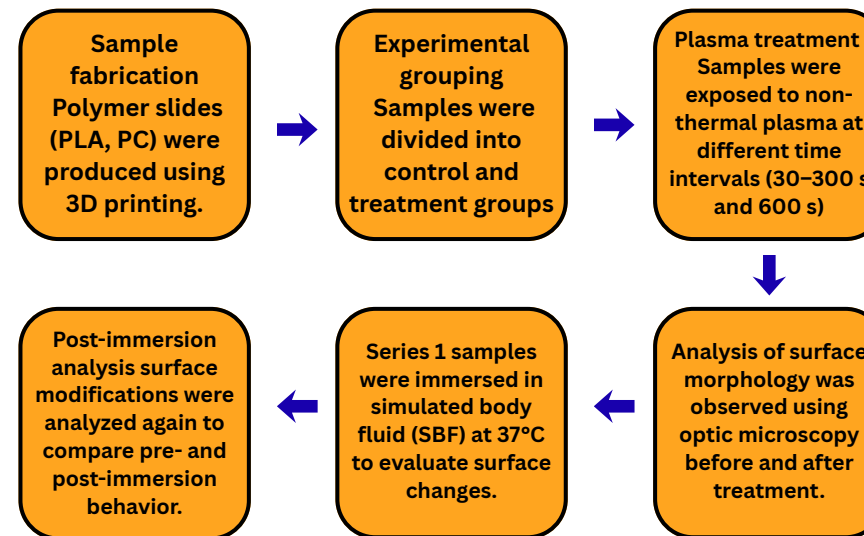


ABSTRACT

This study evaluates the effect of non-thermal plasma treatment on the surface properties of two polymers commonly used in biomedical applications: polylactic acid (PLA) and polycarbonate (PC). Polymer samples were fabricated using 3D printing and exposed to plasma for different time intervals. After treatment, the samples were immersed in simulated body fluid (SBF) to evaluate surface changes.

Surface modifications were analyzed using microscopy and surface characterization techniques. The results suggest that plasma exposure increases surface roughness and hydrophilicity, which may enhance protein adsorption and cell adhesion, making these materials more suitable for biomedical and tissue engineering applications.

METHODOLOGY



ANALYSIS AND RESULTS

Microscopic observations of PLA and PC samples revealed noticeable surface changes after plasma irradiation and SBF immersion. Untreated samples displayed relatively smooth and uniform surfaces, while plasma-treated samples exhibited a more irregular and rough morphology, indicating significant surface modification.

After SBF exposure, treated samples showed a more pronounced surface erosion pattern, suggesting increased surface interaction with the surrounding environment. These observations indicate that plasma treatment alters the surface morphology and topography of the polymers, which may contribute to improved surface activity relevant for biomedical applications.

INTRODUCTION

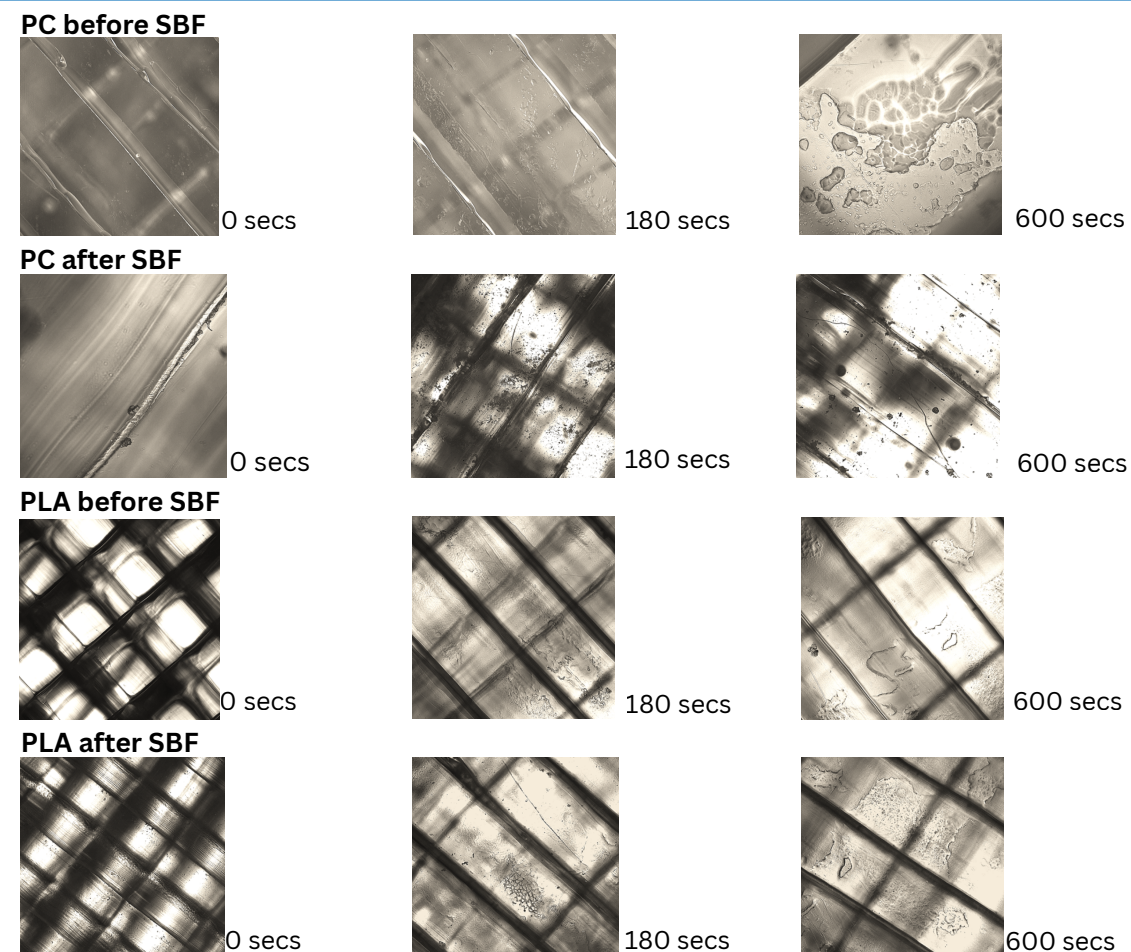
Biomaterials play a critical role in the development of medical devices and tissue engineering scaffolds due to their biocompatibility and mechanical properties. However, many polymers lack sufficient surface bioactivity to promote optimal cell adhesion and proliferation.

Non-thermal plasma treatment is a widely used technique for modifying polymer surfaces without affecting their bulk properties. Plasma exposure can introduce polar functional groups such as hydroxyl (-OH) and carbonyl (C=O), increasing surface energy and wettability. This study investigates how plasma irradiation modifies the surface properties of PLA and PC polymers and how these changes affect their behavior after immersion in simulated body fluid (SBF).

OBJECTIVES

- Evaluate the effect of non-thermal plasma irradiation on polymer surface.
- Compare surface modification in PLA and PC.
- Analyze how different plasma exposure times influence surface behavior.
- Observe changes after SBF immersion related to hydrophilicity and surface morphology.

DATA



CONCLUSIONS AND RECOMMENDATIONS

Plasma treatment significantly modified the surface morphology of the studied polymers. The resulting increase in surface roughness may enhance protein adsorption and cell adhesion, which are key factors for biomedical applications. These results suggest that non-thermal plasma treatment is a promising technique for improving the bioactivity of polymeric biomaterials used in tissue engineering.

FUTURE WORK

Future work will include contact angle measurements to quantify surface hydrophilicity, FTIR analysis to identify functional groups, and impedance measurements to evaluate changes in the electrical properties of the polymers.

REFERENCES

Rondón, J., & Gonzalez-Lizardo, A. (2025, April). Plasma-treated polymeric biomaterials for improved surface and cell adhesion. Polytechnic University of Puerto Rico.